THE CANADIAN GEOGRAPHER LE GEOGRAPHE CANADIEN

No. 5 1955

CONTENTS ---------- TABLE DES MATIERES

Published by

THE CANADIAN ASSOCIATION OF GEOGRAPHERS

Publié par

L'ASSOCIATION CANADIENNE DES GEOGRAPHES

Price $1.00

HT pdf

THE CANADIAN GEOGRAPHER LE GÉOGRAPHE CANADIEN

No. 5 1955

THE TEACHING OF GEOGRAPHY IN CANADA

Neville V. Scarfe

Dean of Education, University of Manitoba

In the summer of 1952, the International Geographical Union held its Triennial Congress in Washington, D.C. Geographers from all over the world met and discussed a wide range of topics. The section on the Teaching of Geography was particularly well attended and developed much interest; so much so that a special Commission was set up to make a report to the next Congress to be held in Rio de Janeiro in 1956. I was privileged to be chosen International Chairman of this Commission, and with six full committee members and six corresponding members have been attempting to gather data from various parts of the world. One means adopted was that of a questionnaire, a copy of which is appended to this paper.

My task today is to give you a summary of the results of the Canadian replies to that questionnaire, and then to add such explanations and comments as I feel are appropriate to this body. The questionnaires were sent to the administrative officials in each province, that is, to those who control and organize curricula. Their replies, of course, indicate only official opinion of what they think is or ought to be happening. Since, however, they control much of the policy, it was important to get their views. Teachers as individuals may wish to have things very different, but can do little to effect changes without official sanction.

Throughout Canada, with the possible exception of Ontario, the curriculum or program of studies is carefully prescribed by Departments of Education. Teachers are not normally allowed to deviate widely from the prescribed program, and there are several checks applied in the form of inspectoral supervision and departmental examinations. There is, therefore, little or no variety of program or point of view within a province, though from one province to another there is great diversity.

This rigid uniformity imposed by the central authority over all teachers within a province tends to restrict the freedom of the teacher to diverge into detailed study of some locally interesting or personnally attractive topic. It tends to keep the teacher and students rather religiously to a specified text. It damps down initiative, enterprise and enthusiasm, and so any subject, let alone geography, becomes dull and boring all too easily.

In Western Canada geography is usually taught inadequately as a minor portion of social studies. In Eastern Canada it is taught as a séparate subject, though often in a dull, formal manner. Nowhere is geography thought to be a very important subject and it is rarely obligatory to teach it at all grades from IV to XII. The tendency is to concentrate it mainly in the elementary school, where it is often thought to be a necessary background to the teaching of history. What is not taught that way is taught in a general science program in the junior high school. The general pattern is to teach some geography of the school region and to introduce the globe in grades III and IV. In grades V and VI the geography of Canada is introduced and large wall maps or atlases are used. In the junior high grades some studies of other countries of the world are considered.

Whenever geography is advocated it is usually thought of as mainly human geography. This is specially true in the elementary school. In junior high grades various countries of the world are studied. This is often miscalled regional geography because it is rarely taught by regions. More often the topic approach with an historical bias is used.

In Western Canada, some physical geography is normally taught as a part of general science, but this is not true in Eastern Canada, where geography is taught separately and given some physical basis.

There is a commonly held, but erroneous, view prevalent right across Canada that geography is mainly an account of how people live in the various regions of the earth. This is essentially the social studies approach to the subject, for thus restricted, it is unnecessary to know much of the physical environment at all, and delightfully vague generalities about human frailties can be passed off as geography.

Social Studies advocates also like the idea that geography helps to understand the problems confronting society. Many of us would agree with the contention but our idea of what geography is would certainly not be the same as that put forward by a social scientist. The difficulty, however, does not lie there; it lies in the assumption that children below Grade XI can understand the problems that confront modern society, and know enough geography to offer sensible solutions.

There are a few who still think of geography as a factual locational subject only, but there are also a few, though increasing, number who think of school geography as an attempt to create an accurate visual image of the chief physical conditions affecting human life on the various parts of the earth. This latter idea, which is the true function of school geography, is however, placed first on the list in one province only, Nova Scotia.

There is a gratifyingly large number of provinces where geography is supposed to be taught for the purpose of helping future citizens think sanely about political and social conditions in the world, and there are many who realize its value in fostering international understanding. Extraordinarily few know how to teach geography so as to achieve these purposes. All too few realize the value of geography in conservation and town and country planning. Almost no one accepts the contribution that geography can make to the enrichment of leisure. Only in Quebec and Prince Edward Island is the subject taught for its own sake.

Unfortunately, there are far too many who think that the main function of geography is to help make history more comprehensible. Whenever geographical facts or ideas are used to help teach hsitory it is always well to remember that it is history that is being taught, not geography. The two subjects are not being integrated, for only one is being taught, the other is being abused. In order to test the issue, it is only necessary to suggest that history should be taught mainly in order to help understand geography. This is thought to be a foolish suggestion by many but it is as defensible as the other proposition.

The other important test of the ill proportioned balance of history and geography in social studies is to enquire whether in any social studies unit the teacher should start with the geographical background or with the chronological recital of the historical facts and ideas. If the geography normally comes first, then the person does not think that geography is equally important with history. Moreover, such a person would be a bad teacher of geography. Geography offers some explanations of the actions recorded by history, and in all good school teaching descriptive material comes before explanatory reasons.

It is one of the great fallacies of our time to suppose that geography is mainly the handmaiden or "one of the two eyes" of history. It is certainly not as true as the statement that history helps to throw light on geographical influences. It will be a red letter day when someone in North America says boldly that geography is more important than history. In Europe, where they have so much more history, it is interesting to note that geography is always equal to and sometimes more important than history. Perhaps it takes a long history to prove it! Far too few people know what geography is or why it is taught.

With regard to methods of teaching, there is, unfortunately, a great gulf between what departmental officials would like to see happening and what actually happens in schools as a result of the rigidity of the restrictive controls applied. The confusion is immediately visible in the replies. It is, for instance, ludicrous to say that teachers start their geography lessons with interesting descriptive details when in the next breath it is admitted that audio-visual aids and outdoor study are not used as the raw material for the descriptive picture. The facts are, of course, that the old outworn method of attempting, in a perfectly futile manner, to deduce human geography from latitude, location, and wind systems is still tragically prevalent, and nowhere worse than where social studies is taught.

Except in Quebec, geography is rarely taught in a systematic and scientific manner. Even there, a good deal of old-fashioned factual drill is implied.

The suggestion that far too many people still think of geography as a purely factual subject only rather than as one giving ideas, insights, impressions and attitudes is borne out by the replies to the question on types of examinations set to test competence in the subject. Almost all examinations are of the factual essay type, or the factual objective type. Very few require correlative or interpretative thinking. Still less require evidence of real associative comprehension. Only in Alberta is there any attempt to discover attitude change as a result of geographical study.

It is not surprising therefore, that geography is rarely, if ever a popular subject in school. This contrasts strongly with the evidence from Europe, where geography is normally a popular, or even the most popular subject. It is interesting to record, however, that the province in which geography does achieve some degree of popularity is the one which records that a good deal of outside material, visual aids, and field study is provided to supplement the text. It is also a province which teaches geography for its own sake. This is perhaps surprising, because we do not usually associate Prince Edward Island with advanced educational thought.

The reasons given for the general unpopularity of geography among children in Canada are three in number. Few teachers know any geography, and fewer still know how to teach it; the textbooks are inadequate; the necessary materials and facilities such as visual aids are lacking or abused.

The questionnaire as it was sent out seemed inordinately long, but much of it was repetitive in order to give an adequate check on the situation. The same question or idea was posed in a number of different ways. By this method a more accurate insight into the provincial opinions and practices was provided. Moreover, it was necessary to set out in various concealed ways most of the views about geography that could be culled from expert authorities. Thus we have a double check on all those who so kindly co-operated with us in answering the questionnaire. We can tell if they understand geography and how it should be taught by the consistency of the various answers.

In general, we find that across Canada, administrators agree that geography is a subject that correlates physical and cultural conditions, despite the known divorce of human from physical geography into social studies and earth science. They agree that it is not a gazetteer of facts but rather a point of view and a group of ideas resulting from the acquisition of a precise and accurate visual image of the various regions of the earth. This is agreed in spite of the emphasis on factual examinations. It is agreed that geography is mainly taught for developing international understanding, even though much of the world is never studied in detail. It is also agreed that it should be taught inductively and by scientific exploratory methods, even though such methods are impossible without visual aids. On the other hand, we find paradoxical disagreement with such facts as "geography must ultimately give its best attention to the environmental conditions rather than to human occupations", that "it is concerned specially with explaining the influence of environment on man", and "that it is futile and unreal to study the world as a whole before studying its parts in detail". There is thus appalling confusion about the content, function and purpose of geography, and tremendous ignorance about good methods of teaching the subject.

I can well imagine that my report today has been distressing to you all, but I believe that I have done nothing more than substantiate what you already know or have suspected. You are all too familiar with the results of the inadequate teaching of geography in schools. You know the causes, and I know you are doing your best to remedy the situation, but I would like to end by pointing out what I feel is a grave error, even in our university teaching of geography, which is perpetuating the evils in the schools.

We suffer in our universities from an overdose of pseudo-scientific geographic verbalism which tries to reduce the subject to a few simple rules or fundamental principles from which, by inspired guesswork, we could work out the geography of any region. There seems to be an inordinate search for factors which control or determine or favour this, that, or the other. Climatic types, idealized continents, limiting factors and many such terms all devitalize and disintegrate geography. They are an attempt to generalize things that do not exist, or do not lend themselves to generalization. Often, perhaps, they are attempts to generalize from far too little really detailed evidence and genuine contact with the actual world.

The essential characteristic of each large or small region of the world is its uniqueness, or as Vidal de la Blache would say, its "personality". This we must teach at all costs, for we rob our subject of reality, vitality and interest if we strive too much to generalize, make rules, lay down principles, or work out segregating factors.

This might be construed perhaps as a plea for more detailed regional studies of small areas and fewer generalized and vague world studies. It might be thought that I think that geography should be taught by studying small regions as a whole with the full range of the interesting interrelationships that give each area its uniqueness, rather than by isolating the various elements of the environment such as structure or relief or economic products and studying those in abstraction over the world. If I have given that impression I am glad, for that is exactly what I mean. Putting it more bluntly, I would ban from all schools and universities such books as Bradley's "World", [1] or "Introduction to Geography" by Kendall, Glendenning and McFadden, [2] not because they are full of vague journalistic platitudes and irrelevancies, but because they murder geography by their method of presentation.

Because geography is so badly taught in school, you must all, for the next ten years, at least, concentrate very heavily on lively, detailed, descriptive regional geography, bringing out relationships and "personality". You must all concentrate on field work, visual aids, and topographic maps. Geography in Canada suffers abominably from unreality, because we are trying to do systematic geography without a sound basis of regional studies. Teachers go from university to school not knowing the essential school work, and quite unable to use or see the need for a good atlas. Thus geography is often a vague noise in the throat, or verbal gymnastics. There are no vivid images, no fine impressions, no great ideas.

APPENDIX

ENQUIRY ON TEACHING OF GEOGRAPHY

1. For which age groups is school compulsory in your country, state or province? _____

2. Until what age do most (over 75%) children attend school? _____

3. How many years of schooling do most (over 75%) children have? _____

4. Is there a single unified curriculum or program of study set up for all schools in your country, state or province, or are schools free to choose their own program?
   Unified _____ Free to Choose _____

5. (a) With what age groups or grades is geography regularly taught? _____
   (b) If not taught regularly with most children between 8 and 15 years old (grades III - X), please explain why not. _____

6. (a) Is geography restricted to certain age or grade levels? _____
   (b) If so, to which? _____
   (c) Why is it thus restricted? _____

---

[1] Bradley, John Hodgdon: World Geography; Ginn and Company, Toronto, 1948.

[2] Kendall, Henry M., Robert M. Glendenning and Clifford H. MacFadden: Introduction to Geography; Harcourt, Brace and Company, New York, 1951.

7. (a) Is geography above the age of 8 years (grade III) normally taught as a separate subject or is it integrated with other subjects as in Social Studies or in General Science? Separate _____ Integrated _____

(b) Is this true of all age levels? Yes _____ No _____

(c) How is the practice in your area justified? _____

8. Which of the following types of geography are emphasized at all ages or at some age or grade levels only (please specify)?

	All Ages	Levels Only
Physical Geography (Earth Science or Physiography)	_____	_____
Economic Geography (Studies of Occupations)	_____	_____
Human Geography (How People Live in Communities)	_____	_____
Regional Geography (Studies of Countries and Regions)	_____	_____

9. (a) Is Physical Geography (earth science) taught separately from human geography? Yes _____ No _____

(b) If yes, at what levels? _____

10. Which of the following definitions of geography best fits that which is taught in your country? (If you check more than one indicate by putting 1, 2, 3, 4, against the items your order of emphasis).

(a) Mainly a description of scenery and occupations in the various regions of the earth. _____

(b) Mainly an explanation of scenery and occupations in the various regions of the earth. _____

(c) Mainly an account of how people live in the various regions of the earth. _____

(d) Mainly an account of the relief and climate in the various regions of the earth. _____

(e) Mainly the location of places on the earth. _____

(f) Mainly an attempt to create an accurate visual image of the chief physical conditions affecting human life on the various regions of the earth. _____

(g) Mainly the collection of facts about the various regions of the earth. _____

(h) Mainly an attempt to understand problems confronting modern society. _____

(i) Some other definition. (Please specify) _____

11. Which of the following purposes best fits that for which geography is taught in your country? (If you check more than one indicate by putting 1, 2, 3, 4, etc., against the items your order of emphasis.)

(a) To help understand history. _____

(b) To help future citizens think sanely about political and social conditions in the world. _____

(c) To develop international understanding. _____

(d) To help with conservation plans. _____

(e) To help with town and country planning. _____

(f) To provide interesting leisure time pursuits. _____

(g) For its own sake as a subject of intrainsic interest. _____

(h) To help understand maps. _____

12. Which of the following methods are normally used in your country? (If more than one is checked indicate emphasis by placing 1, 2, 3, etc., against the items. If necessary indicate age level to which applicable.)

(a) Starting with interesting descriptive details and working towards generalized relationships. _____

(b) Pursuing the well known scientific processes of observing, recording, describing and correlating. _____

(c) Deducing human geography from latitude, location, wind systems, and relief features. _____

(d) Using audio-visual aids, outdoor visits, as raw material for pupil study. _____

(e) Giving plenty of drill in names, products, map drawing, and note making. _____

13. At what age or grade are the following introduced?

(a) Globes with topographic features shown. _____

(b) Atlases with maps of continents on separate pages. _____

(c) Topographic maps of small areas on such scales as 1:50,000, 1:100,000 and 1:250,000. _____

(d) Study of the home area. _____

(e) Study of the home land. _____

(f) Systematic study of countries other than the home land. _____

14. What proportion of time in your total geography curriculum is devoted to –

(a) Home or local geography? 1/2___ 1/3___ 1/4___ 1/5___ 1/10___

(b) Home land or Fatherland? 1/2___ 1/3___ 1/4___ 1/5___ 1/10___

15. Which of the following types of final or external examinations are set to test the results of geography teaching?

(a) Factual essay type. _____

(b) Problem essay type. _____

(c) Objective factual type. _____

(d) Objective comprehension type. _____

(e) Objective attitude type. _____

16. Which of the following ratings for geography do you think would be given by children to whom it is regularly taught in your schools?

(a) As the most popular (or well liked) subject in school. _____

(b) As one of the more popular subjects. _____

(c) As an average subject so far as popularity is concerned. _____

(d) As a relatively unpopular subject. _____

(e) As the least popular of all subjects. _____

Please account for the rating children give it, indicating where necessary differences at various age or grade levels.

17. For your interest the Commission has set out below very brief, arbitrary, and incomplete statements about geography. Please read through these statements and say to what extent these statements represent the characteristic view of the subject in your country, state or province. These statements are not intended to be correct or accurate or authoritative. They are simply arbitrary statements devised to act as a means of obtaining your views and comments. If the following statements correspond almost exactly with those accepted in your area put (a) in the margin opposite the statement. If the statement corresponds fairly closely put (b), if not very closely put (c), and if hardly at all put (d).

(i) The purpose of geography teachers in school is to try to create in the minds of children accurate visual images of the environmental conditions which exist in the major regions or countries of the world so that they can understand what it looks like and feels like to live and work in those regions. _____

(ii) Geographers describe and discuss certain environmental conditions only. Such conditions are those which exhibit an obvious influence on the way men live and work. _____

(iii) Geography teachers are very much concerned with the adjustments men make to suit or to overcome environmental conditions. These adjustments form the starting point of geographical teaching units and form the motivating interest for seeking to imagine accurately and to understand the environmental factors in any area. _____

(iv) The environment presents problems to men who live on particular parts of the earth. To understand those problems gives a clue to understanding life in those areas. _____

(v) Geography has the purpose of helping children understand the way of life of men over the earth. Sympathetic understanding of their political and social problems may result, and international goodwill may possibly arise. _____

(vi) Geography deals primarily with the environmental conditions in various regions rather than with occupations or ways of life, but it does not omit either. _____

(vii) Geography deals with regions as a whole rather than with separate items in regions such as rivers, mountains, or erosion, wheat, minerals or transport though all such things inevitably come in. _____

(viii) Only after long study of regions do children arrive at a stage when they can view the world as a whole and as a unit. _____

(ix) Geography is not a locational or map study of where places are. _____

(x) Geography is not a gazetteer subject containing lists of names of places or products. _____

(xi) Geography is not primarily about maps. _____

(xii) Geography is not mainly a description of how men earn a living, or of the processes in the production or manufacture of certain articles. _____

(xiii) Geography is not really physical, economic, or human, it is essentially a study of all these together in regions. _____

(xiv) Geography is not merely one of the two eyes of history, nor is it simply a means of humanizing science. _____

(xv) Geography is as much concerned with ideas, accurate impressions and correct visual images as it is with exact factual information or precise location, but it never neglects the latter. Modern geography is, however, very concerned with not neglecting the former. _____

(xvi) In teaching geography it is important to start with observation and description before proceeding to the more abstract and precise use of maps, and before too great an emphasis is put on reasoning and correlation. It is important to start with human activity and proceed towards the study of environmental conditions. It is important to start with effects and then work towards causes. It is important to start with details and end with rules, definitions and generalizations. _____

(xvii) Geography lessons should be active periods of investigation and discovery by children. The subject cannot be taught well without the use of pictures, specimens and models, true stories, detailed maps of small areas, statistics, and official reports. Too great reliance on verbal instruction or on textbooks is to be discouraged. _____

(xviii) A geography study unit is rather like a science study unit in which experimental investigations by students themselves are permitted. Geographical activity is not a book or library hunt for facts. Desirable types of geographical activity are best illustrated by an actual study visit in the field, but it is equally possible in the geographical laboratory of a school to provide pictures, specimens and maps which children may study by themselves under directed guidance in order to discover what it looks like and feels like to live and work in a particular region and how men adjust their lives to suit the environmental conditions. _____

(xix) Geography cannot be well taught by the lecture or chalk and talk method, but there is a place for drill and for learning by heart. _____

(xx) There is a big place for artistic display, for exhibitions, for dramatic work and for map making as a means of expressing acquired knowledge and impressions in concrete and visible form. A geography room is thus partly a laboratory and partly a craft room. _____

MAP OF THE PHYSIOGRAPHIC REGIONS OF UNGAVA-LABRADOR

Mary C.V. Douglas and R.N. Drummond

Arctic Institute of North America

Figure 1. Sample map on 8-mile scale showing the physiographic regions. From maps on this scale the more generalized regional divisions were compiled into the Physiographic regions of Quebec-Labrador.

Introduction

The map of the Physiographic Regions of Quebec-Labrador has resulted from an air photo study carried out over the last two years. The project, inspired and directed by Dr. J. T. Wilson, Professor of Geophysics, University of Toronto, who has long recognized the value of air photos, was undertaken with the aid of a Defence Research Board grant, administered by the Arctic Institute of North America.

The main purpose of the project was to prepare reconnaissance maps, on the 8 miles to 1 inch scale, of the surficial deposits and structural features of Ungava-Labrador. These include drumlins, eskers, sand deposits, percentage outcrop, annual moraines, raised beaches, muskeg, foliations, lineations and dykes. From these thirty-seven 8 mile sheets, five general maps were compiled on a 32 miles to 1 inch scale. These are: (1) Drumlins, (2) Eskers, (3) Rock and Drift, (4) Faults and Foliation, which are discussed elsewhere,[1-2] and (5) Physiographic Regions. The latter is discussed here.

The purpose of this map is to give a clear general picture of the main physiographic provinces of Ungava-Labrador and to create a basis on which a more detailed regional analysis can be made.

THE BASIS OF CLASSIFICATION

This is the first attempt to divide Ungava-Labrador into Physiographic Types although many have tried previously to classify the Precambrian rocks of the Canadian Shield[3-6] and Hare[7] mapped the main structural and relief features.

Only the physiographic types large enough to be seen on this scale are shown as a region on this map. The classification of the types is largely generic, though it is to some extent, of necessity, arbitrary. For example, peneplain levels are classified generally as 'high' and 'low', which probably represent peneplains of different ages. Only where it is possible to compare and correlate these levels in more detail, and establish their relationships, will a truly generic classification be possible.

---

[1] Mary C. V. Douglas, and R. N. Drummond: Glacial Features of Ungava from Air Photos., Trans. R.S.C., XVVII, Ser. III, June, 1953.

[2] Drummond, R.N., and Mary C.V. Douglas: Glacial Landforms of Quebec-Labrador as seen from Air Photos. Paper given to the Geological Society of America, Toronto, 1953.

[3] Adams, F.D., and A.P. Coleman: In Problems of American Geology, 1915.

[4] Geological Survey of Canada in Economic Minerals of Canada, 3rd ed., 1947.

[5] Brock, R.W.: In T.C. Phemister, Geol. Mag., March, 1936.

[6] Dresser, John A., and T.C. Denis: Geology of Quebec, Bureau des Mines, Quebec, 1944.

[7] Hare, F.K.: The Labrador Frontier., Geog. Rev., XLII, pp. 405-424, 1952.

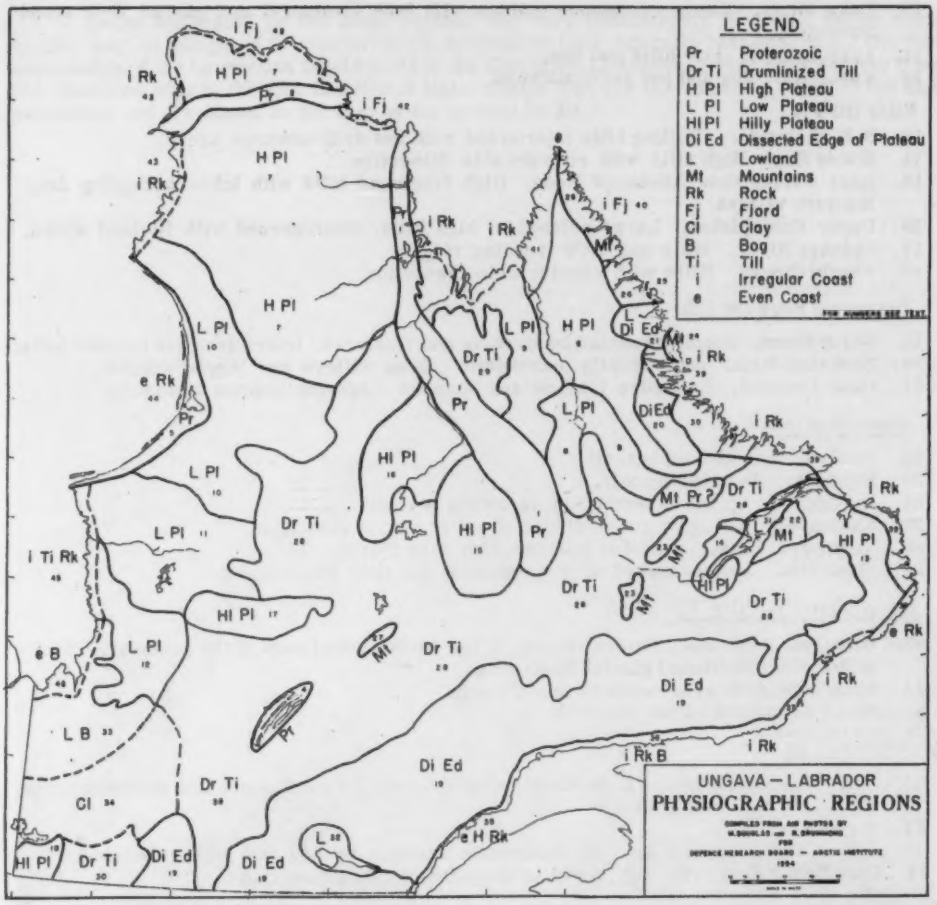

Figure 2.

THE PHYSIOGRAPHIC REGIONS OF UNGAVA-LABRADOR

I. Proterozoics (Pr)

A. Folded Mountain Belts

1. Labrador Trough
2. Cape Smith Range
3. Naskaupi Mountains
4. Mistassini

B. Cuestas

5. Richmond Gulf

II. Plateau (Pl)

A. High (H Pl)

6. Nain-George River. Remarkably flat.
7. Povungnituk-Payne Lake. Moderately flat. Solifluction pattern.

B. Low (L Pl)

8. Naskaupi-George River. Low hills, numerous lakes.
9. S. Ungava Bay. Low rolling hills.
10. Lake Minto. Fairly continuous plateau with both structural and glacial E-W trend throughout.
11. Lake Sakami. Low hills and bog.
12. Eastmain. Bog and low rock outcrops.

C. Hilly (Hl Pl)

13. S.E. Labrador. Rolling hills intermixed with low drift-covered areas.
14. Goose Bay. High hills with considerable dissection.
15. Inter Kaniapiskau-Ashuanipi Node. High fractured hills with lakes occupying deep fracture valleys.
16. Upper Kaniapiskau. Large patches of high hills, interspersed with lowland areas.
17. Opinaca River. Hills and E-W trending ridges.
18. Abitibi-Rouyn. Hills with considerable dissection.

III. Dissected Edge (Di Ed)

19. North Shore. Deeply dissected by streams and fractures. Interfluves are rounded hills.
20. Naskaupi-Nain. Area mostly anorthosite. Deep valleys and jagged uplands.
21. Okak Lowland. Extensive lowland and rounded dissected plateau remnants.

IV. Mountains (Mt)

22. Mealys. Anorthosite massif.
23. Hope Mts. Isolated massif.
24. Kiglapaits. Upland dissected by mountain glaciation.
25. Kaumajets. Volcanic rocks dissected by mountain glaciation.
26. Torngats. Highly glaciated uplands with deep fjords.
27. Otish Mts. Southeastward dipping cuestas, possibly Proterozoic.

V. Drumlinized Till (Dr Ti)

28. Drumlin. Drift belt. Extensive area in the south central part of the peninsula. Heavy drift. Well developed glacial landforms.
29. Less extensive area north of the Trough.
30. Small area south of the Clay Belt.

VI. Lowlands (L)

31. Lake Melville. Includes Lake Melville, strip along the north shore and Hamilton River. Extensive bogs and terraces.
32. Saguenay-Graben.
33. James Bay Lowland. Largely Palaeozoic overlain by bog and marine beaches.
34. Clay Belt. Flat area due partly to deposits of lacustrine clays.

VII. Coast (St. Lawrence River to James Bay)

35. Even high rocky coast of the edge of the Laurentian Shield. Some low sandy alluvium along the shore.
36. Irregular rocky coast with stretches of bog and beaches.
37. Irregular rocky coast. Few bogs or alluvial deposits.
38. Even rocky shore-line, few bays and inlets.
39. Includes the Labrador Coast to the Kiglapait Mts.
(For the next divisions see 21, 24, 25).
40. Fjordic coast penetrating the Torngat Mts.
41. Irregular rocky coast of Ungava Bay.
42. Hudson Strait. Fjordic coast reaches elevations of 2,000 feet.
43. Irregular rocky coast. Bays do not penetrate so far as on the Labrador Coast.
44. Even rocky coast. Two cuestas line much of the coast. The outer, an island chain, the inner, along the water's edge. Scarps face E. (Proterozoic of 5).
45. Irregular coast with considerable areas of till and rock.
46. Regular coast almost entirely bog and mud flats.

When the origin of the type is not known, or where relief is the most important quality, relief is used as the basis for the classification as it depicts the main characteristics, e.g., 'Mountains' and 'Lowlands'.

Areas designated by the same symbol may vary considerably in detail, though their origins may be thought to be similar, local differences have naturally resulted, e.g., the dissected edge of the Laurentian Shield north of the Gulf of St. Lawrence differs considerably from the dissected edge in the Anorthosites of Nain, though both are the dissected edges of the high peneplains and are shown on the map by the symbol Di Ed.

Figure 3. The high Nain-George River Plateau looking west. This plateau slopes gently westward; the eastern edge falls off abruptly seaward. It is dissected by great glaciated fracture valleys. (RCAF Photo)

On this map we have attempted to make a regional division of the coasts as well as the interior. As the coasts can all be classified as emerging submerged coasts any further divisions must be based on relief, configuration and structure: hence the terms, regular, irregular, fjord, mountainous, etc.

It is not possible to classify the Coasts completely independently of the interior. Where a physiographic type of the interior extends to the coast, a dotted line only separates the coastal and interior areas. When the physiographic type ends at the coastal zone a solid line separated the areas. In a few instances the coastal area is at the same time a coastal and an interior type and is therefore given two numbers; e.g., the Torngat Mountains (26) and the fjordic irregular coast (40).

Figure 4. The dissected edge of the high plateau south of Figure 1. Looking west over Harp Lake (see Figure 1). (RCAF Photo)

GENERAL PHYSIOGRAPHY

The classical description of the area, as given by Low, Dresser and others as an old peneplain surface highest on the east and southeast edges from whence it falls off abruptly seaward, and characterized generally by its rolling surface, remarkably even sky line, and numerous lakes, has stood in the main, to this fairly detailed air photo study of the area.

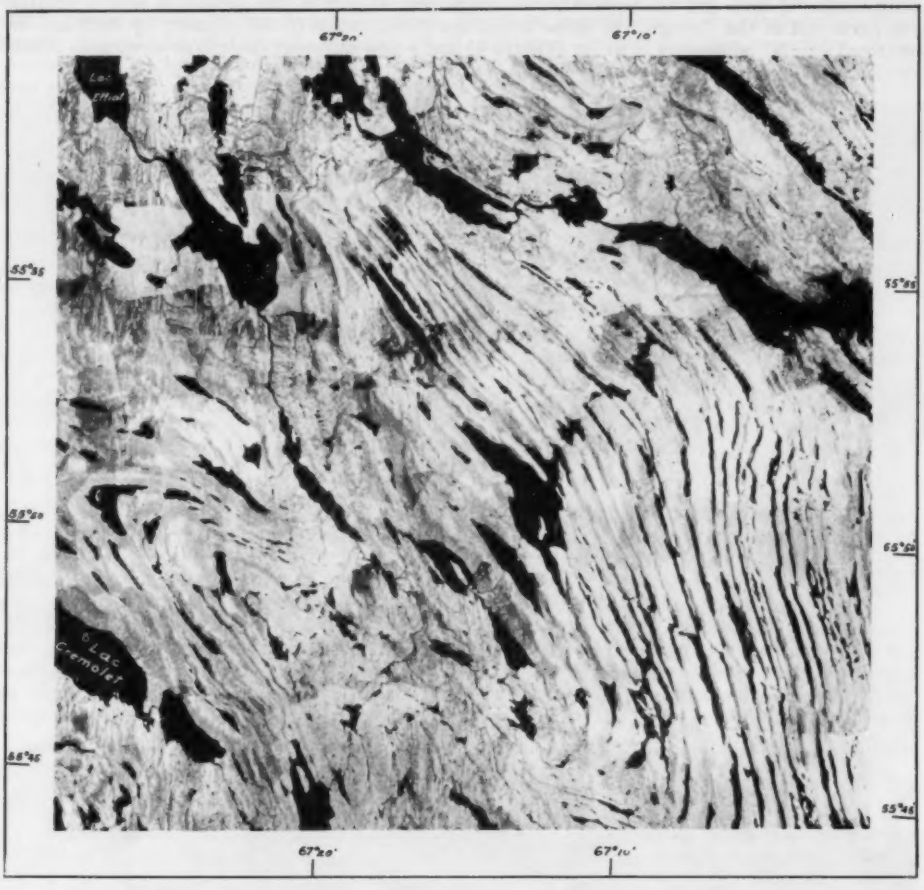

Figure 5. Mosaic of air photographs of the folded rocky ridges of the Labrador Trough. (Courtesy RCAF and Topographical Survey, Dept. of Mines and Technical Surveys, Ottawa.)

We have found however, that there is considerable variety over this surface both in relief and structure. There are several peneplain levels some of the highest of which have a remarkably even surface as, for example, Nain-George River Plateau. (Figure 3) Many of the high plateaux fall off abruptly seaward and have been highly dissected by streams and fractures, and have been named here the Dissected Edge. (Figure 4) Over the lower peneplain surfaces remnants of the higher levels frequently stand out as isolated hills, sometimes several thousand feet above the general level.

The Peninsula is also characterized by four or five[1] belts of folded Proterozoics which may have little relative relief but are made up of outstanding parallel rocky ridges and folds, (Figure 5) This survey has shown that the extent of these Proterozoic areas is greater than was previously believed.

The estimate of percentage drift cover made in this survey has shown that the greatest accumulation of drift and till occurs in the south central part of the peninsula with a smaller area northeast of the Trough. In these areas the modification of the country by drift and depositional glacial landforms is great (Figure 6) and a new physiographic type emerges, named drumlinized till, Dr Ti on the map - or the Drumlin-Drift belt.

Figure 6. Typical terrain of the Drumlinized Till zone. Note the drumlins, esker and what has been called 'ribble' till (centre). (RCAF Photo)

[1] The Nakaupi Ranges and the Mistassini folds may be part of the same formation.

MAPPING OF PHYSIOGRAPHY AND VEGETATION IN LABRADOR-UNGAVA

- A Review of Reconnaissance Methods -

F. Kenneth Hare

McGill University

INTRODUCTION

I have suggested elsewhere[1] that the Canadian field sciences - geography, geology, botany and forestry among them - need a new scale of survey, a scale more adapted to the needs of national inventory than those that we currently employ. In effect, field survey in this country has proceeded at two principal scales. The first, established in the nineteenth century by such pioneers as McConnell, Macoun, G. M. Dawson, Tyrrell and Low, consisted of the perambulating reconnaissance in which a handful of scientific observers, usually assisted by native guides, prepared field-notes on what they could observe along the water-courses that they followed. We still owe much of what we know about the geology of the remoter parts of the Shield to these magnificent traverses. The second scale might be labelled the "intensive", and its typical form consists of a detailed survey at the one-inch to the mile scale; the purpose of such surveys is not reconnaissance, but accurate topographic representation of geology, forest resources and the like.

The wide gulf between these two scales of survey has bothered us all for many years. The vast expenditure of effort necessary for the completion of a single one-inch sheet of any kind makes us despair of ever completing the survey of all Canada on this basis - which is more appropriate to a country like the United Kingdom, from whom we have inherited many of our concepts of field research. It is clear to everyone that a faster method of procedure is required - something intermediate between the solitary journeys of Low and the detailed topographic sheets of populated southern Canada. In recent years, for example, the Geological Survey has developed a new and bold system of reconnaissance, in which helicopters are used to increase the mobility of the field parties. One party, whose results have been published, completed the reconnaissance of 57,000 square miles of Keewatin in a single summer, and at an intensity that would have astonished Low.

The fact is that the aircraft, the aerial camera and the airborne geophysical instrument are working a revolution in survey methods. This paper is concerned with the application of these new resources to the completion of the geographical reconnaissance of Canada. It seems to many of us that a unique and priceless opportunity of national service lies within our professional grasp, if we can make ourselves the masters of the new methods.

Specifically, the work of the McGill University group that has been investigating the surface characteristics of Labrador-Ungava by means of aerial photography, is dealt with here. This work began in 1948. The earliest stages consisted of field reconnaissances by Lash, Drummond,[2] McKay,[3] Blake[4] and Gadbois[5] - to establish (i) the appropriate classification of

---

[1] Hare, F.K.: "The Re-exploration of Canada", The Canadian Geographer, 4, 1954, pp. 85-88.

[2] Drummond, R. N.: A Traverse of the Romaine River; thesis presented in partial fulfilment of the requirements for the degree of Master of Science, McGill University, 1950.

[3] McKay, I.A.: Forest Types of Lake Melville Plain and Mealy Mountains; report and map. McGill University, 1952.

[4] Blake, W., Jr.: Vegetation and Physiography in the Goose Bay Area, Labrador; thesis presented in partial fulfilment of the requirements for the degree of Master of Science, McGill University, 1953.

[5] Gadbois, Pierre, and I.A. McKay: "A Vegetation Map of the Carter Basin Area, Lake Melville Lowlands, Newfoundland"; Geographical Bulletin, 5, 1954, pp. viii-3.

vegetation cover-types, and (ii) the keys with which to identify them on high-altitude photographs. This work either has been or will be described elsewhere, and no attempt will be made here to restate its progress. The present paper deals with the application of these methods to reconnaissance mapping. Similar work is being carried out by Douglas and Drummond.[1] Though their objectives have been slightly different, their methods resemble our own in many ways, and are an example of the effectiveness of aerial survey in the right hands. Tribute is due, in particular, to Drummond, whose pioneer field studies on the Romaine and the Koksoak-Kaniapiskau made possible the entire subsequent programme of the McGill University group.

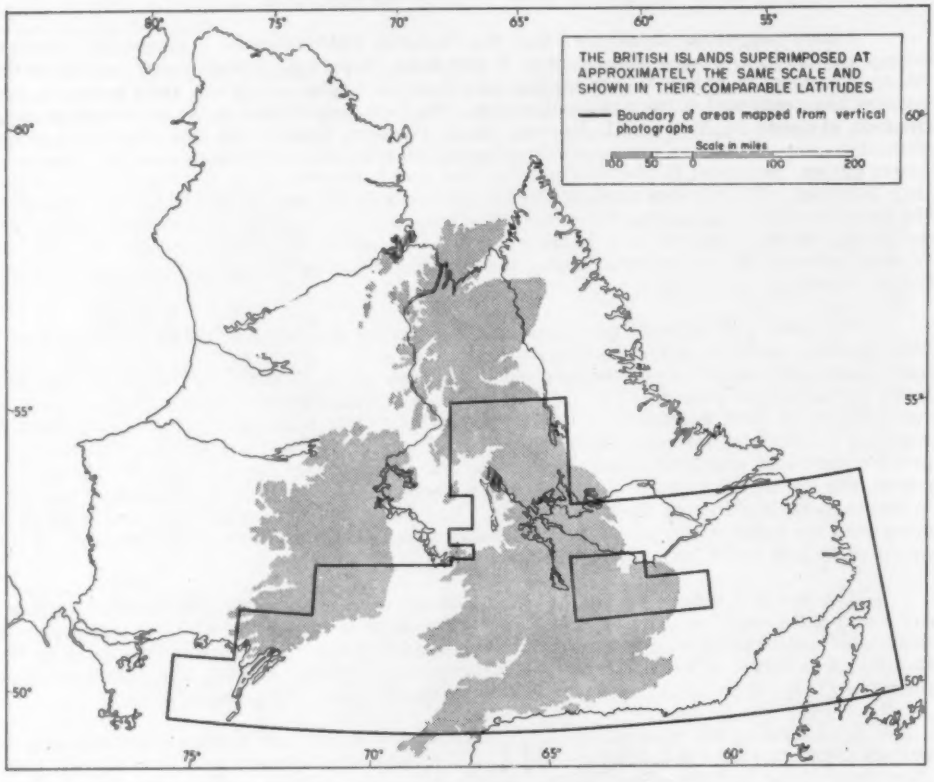

Figure 1.

OBJECTIVE AND ACHIEVEMENT

The purpose has been to construct reconnaissance maps on the 1:500,000 scale (8 miles to 1 inch) of cover-type (principally vegetation) and surface-type. The scale adopted is the smallest on which adequate topographic sketching can be attempted, and it has the further advantage that the standard 8 miles to 1 inch base maps of the National Topographic Series are available.

---

[1] Douglas, Mary, and R.N. Drummond: "Air Photo Interpretation of Glacial and Physiographic Features of Québec-Labrador", supra, pp. 9-16.

The method has been the interpretation of the vertical aerial photographs available in the National Air Photographic Library, Department of Mines and Technical Surveys, Ottawa. These photographs were nearly all taken in the post-war years. A six-inch camera was used in all areas, and the height of flight varied from 7,500 to 30,000 feet (corresponding to scales varying from about 1:14,000 to 1:58,000). Most of the area was flown at 17,000 or 20,000 feet. The work was partly carried out by the R.C.A.F., and partly by private companies - notably by Spartan Airways, Photographic Survey Corporation, and Aero Surveys. In most areas the quality of the photography is high, and the flight-line grid rectilineal and complete. A few areas were photographed beneath a high overcast, rendering interpretation difficult because of the lact of contrast and shadow. Near Lake Mistassini, much of the coverage is of little value because it was taken before the break-up and snow melt.

We have completed the 1:500,000 mapping of all areas south of 56° N. for which vertical photographs are available, except for a few isolated areas. (See Figure 1)

METHODS

Direct Topographic Sketching

The 1:500,000 maps were drawn by direct sketching from the vertical photographs. The flight-lines were transcribed from the master indices at the Library onto our working base maps (the standard black and blue 8 miles to 1 inch sheets). Since stereoscopic coverage was not needed, we rejected alternate flight-lines and alternate photographs. In some areas it was possible to use every third flight-line and every third photograph. Every effort was made to avoid both "overlap and underlap", but it is quite impossible to avoid both unless one lays down mosaics, a slow and cumbersome method. In fifty of the unit areas analysed, the total overlap was 13 per cent - i.e., 13 per cent of the area was examined twice - and the "underlap" was 9 per cent, which was land that was not seen at all. By taking these hazards in our stride, we increased our speed many times. An area of 128 square miles on the Ashuanipi sheet (23 SE) was interpreted on lay-down mosaics, and took seven hours to complete. Another area, of 143 square miles, interpreted by the strip method described above took 1 hour 27 minutes.

Two map series were compiled, one showing cover-type and the other surface-type. They were prepared simultaneously by identical methods. Kodatrace templates were prepared having orifices equal on the 8-mile scale to the size of the standard vertical photographs on all the scales encountered. The interpreter moved his template along the flight-line (which was already transcribed on to the base map) and sketched on the base map the evidence shown by the photographs. A very considerable degree of skill was needed (and perforce acquired!) to produce on a piece of paper no more than one inch across a reasonable sketch of what one saw on a photograph nine or ten times as big. Inevitably, the original map sheets tended to overestimate the trace elements and underestimate the area of the dominant cover in all areas. This difficulty was in part offset by an independent system of statistical checking, described below. A simple colour scheme was used to identify the cover-types and landforms; the same system is used on the 1:1,000,000 reductions.

About 1,000 photographs are needed to cover the typical 8-mile sheet (assuming 20,000 feet photography). The group found that each interpreter, working without interruption, could complete the tasks described above, as well as the statistical check outlined later, in about four weeks, or about 200 hours in all. Photographs at altitudes below 15,000 feet were, however, nearly useless, because the template orifice became too small. Such photographs cannot be used for mapping directly on the 1:500,000 scale.

The expeditious completion of such a programme presupposes that the interpreters are equipped with a satisfactory classification of cover-types and landforms before they begin work - and, of course, that they know how to identify them on the photographs. The classifications used in the present work are tabulated below. These represent necessary simplifications of the more complex classifications used by the group in larger scale work.

A. Cover-Types

1. Vegetation	Nature
Closed-crown forest ..... (M)- green	Coniferous or mixed forest with deeply shaded floor not visible in photos.

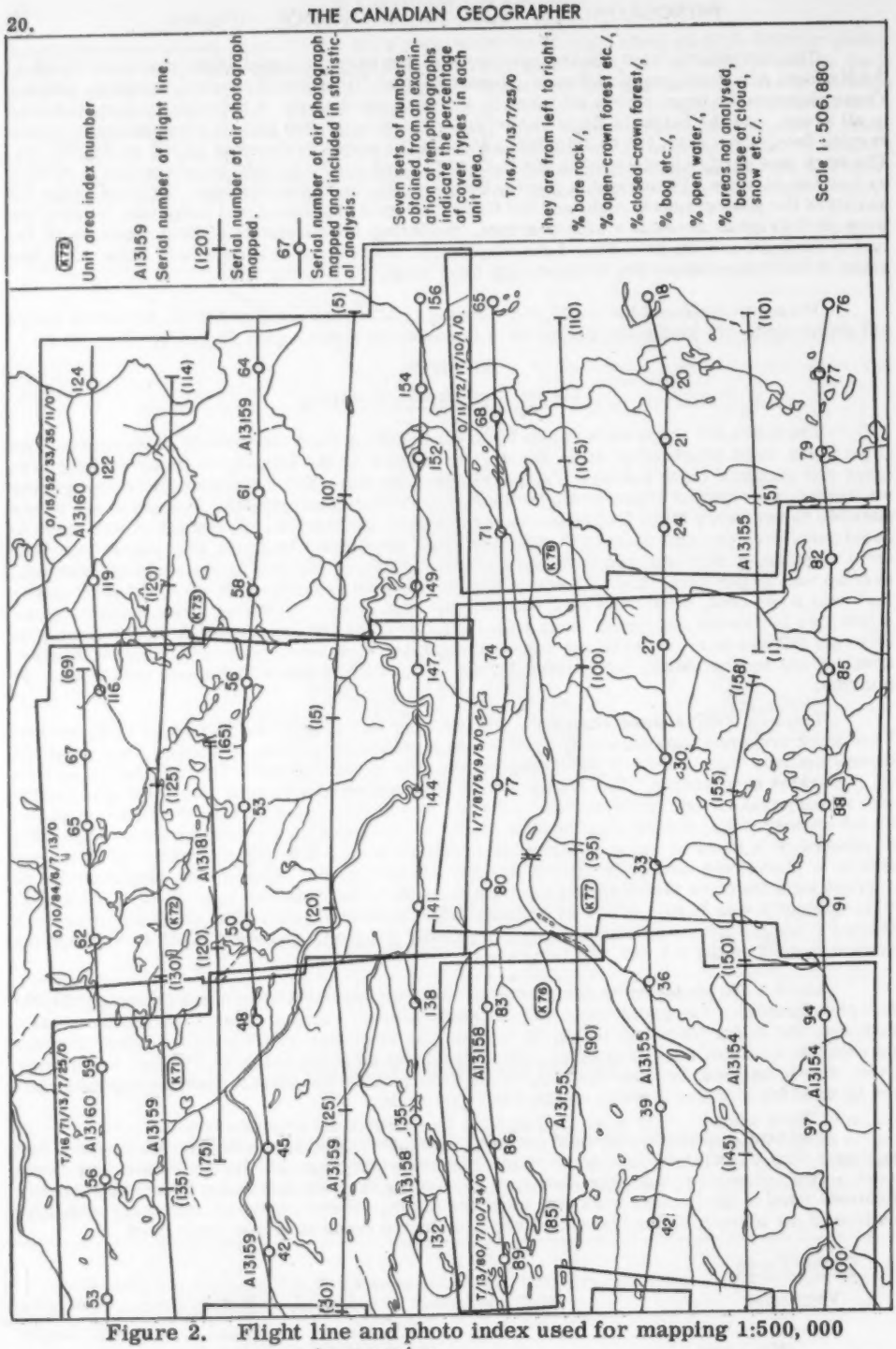

Figure 2. Flight line and photo index used for mapping 1:500, 000 cover-type series.

Lichen woodland ..... (X)- yellow	Open structure; trees isolated or thinly spaced. Floor clearly visible on photos, normally lichen-covered. Shrub-layer also usually present.
Bog and Muskeg ..... (H)- brown	Includes all types dominated by presence of undrainable water. String-bog and spruce muskeg are the commonest.
Bare rock, dry scrub, etc. ..... (UX)- red	Includes all types characteristic of rocky or sandy areas where continuous, well developed vegetation is absent because of thinness or poverty of soil.
2. Others	
Open water ..... (UH)- no colour	Lakes, ponds, rivers, etc.
Burned areas ..... (F)- purple	Includes all areas whose appearance on aerial photographs is dominated by the effects of burn, whether or not regeneration is well advanced.
B. Landforms	
1. Bedrock-controlled relief (red)	
Rock-plains ..... (superimposed P)	All areas of very low relief in which bedrock structure or jointing is visible.
Low-hills ..... (plain wash of red)	Areas of undulating relief in which the erosional pattern is suggestive of bedrock control (e. g., jointing or structure visible; relief too bold to be supported by unconsolidated materials).
Bold-hills ..... (inverted V superimposed)	Hilly areas in which relief is high enough (i) to create dark shadows, (ii) to "zone" vegetation altitudinally.
Glacially moulded hilly terrain ..... (red, with superimposed drumlin symbols)	Hilly areas showing crag-and-tail or moutonnée effects.
2. Drift-controlled relief	
Undifferentiated drift-plains ..... (plain wash or brown)	All areas with patternless cover masking bedrock "grain". Includes lake and marine silts and clays, formless ground-moraine, etc. Also includes extensive organic deposits.
Drumlinized or fluted drift plains ..... (brown with heavier brown or black drumlin symbols)	All drift covers displaying glacial moulding. Includes drumlin and drumlinoid fields, fluted or grooved till-plains.
Rippled till-plains ..... (brown with ~ symbols)	Includes characteristic pattern sometimes referred to as "dead-ice" moraine.
Eskers, gravel-trains and sand plains .. (yellow, with dots or circles underpointed)	Includes all demonstrably sandy or gravelly terrain, overwhelmingly eskers with associated outward and valley gravel-trains. Also includes sandy lake deposits.
3. Special Landforms	
Incised or entrenched valleys ..... (green stripe)	All drainage channels visibly entrenched into the plateau to an anomalous degree.
Apparent spillways ..... (~)	All abandoned channels, mostly late glacial.

(N.B. The notes in brackets give details of the colours and symbols used on the 1:500,000 and 1:1,000,000 map series).

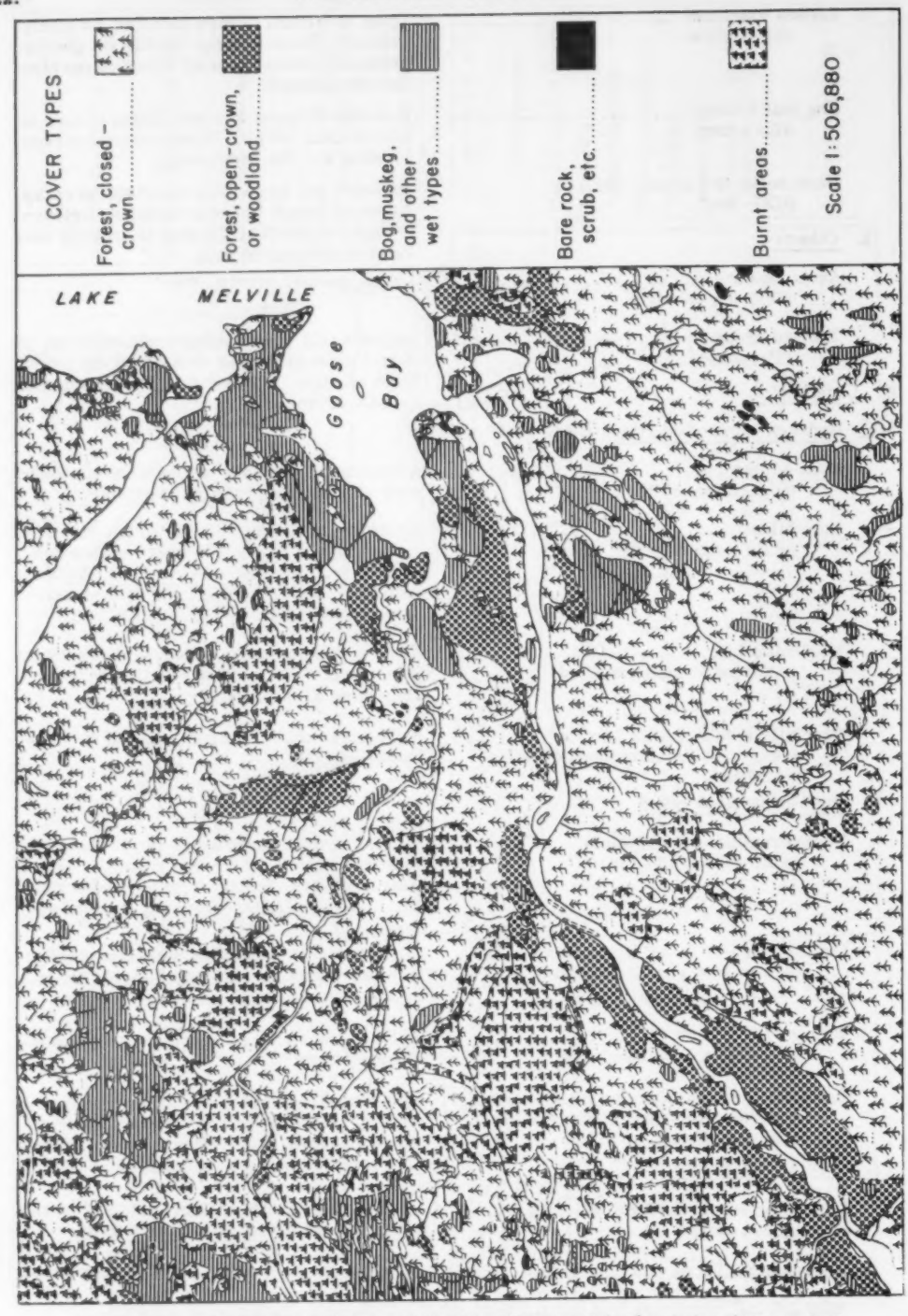

Figure 3. A portion of one of the 8 miles to 1 inch cover-type maps. See text for full explanation of legend.

This list refers, of course, to the detail identified on the small-scale map series only. A glance at any of these maps will show that further subdivision of the types is out of the question. Even with as broad a grouping as this, the detail on the maps is very great.

Statistical Inventory

It has already been stated that the process of direct topographic sketching, though it gives a qualitatively good approximation to the real patterns, is inevitably subject to serious errors of quantity. We accordingly decided to supplement the survey by an independent statistical inventory of the cover-types. We did not, however, extend this second method to the surface-types, since the work of Douglas and Drummond (op. cit.) was of this kind.

The photographs used in the topographic sketching were grouped together into unit areas of ten photographs, covering an average of 280 square miles. The centres of these unit areas were then accurately located on all our map sheets. Their boundaries were also transcribed for permanent record on to the 1:500,000 cover-type map. It was found impossible to make these unit areas regular in shape or in spacing, since these elements depend on the scale of the photographs and the layout of the flight-lines. Nevertheless, efforts were made to make them roughly rectangular, similar in size and regular in distribution.

The interpreters then trained themselves to estimate in tenths the extent of the following cover-types:-

Vegetation: Bare rock, etc.
Lichen woodland
Closed-crown forest
Bog and muskeg
Open Water
Burned Areas
Areas invisible because of bad photography

The vegetation types were estimated so that together their amounts total ten units; hence the statistics for these quantities refer only to dry land. Efforts were made to identify the nature of the cover prior to destruction if the surface is at present burned. The estimates of open water, burns and areas invisible were, however, made with reference to the whole surface of the unit area. These estimates were then made and tabulated for all ten photographs of the unit area; the totals naturally appear as percentages without further arithmetic change.

An average of 100 unit areas - 1,000 photographs in all - are needed to cover one 8-mile sheet. We have filed copies of the tabulation sheets for the entire mapped area, and are thus in a position to provide immediate inventories over any required area; considerable use has already been made of these data by foresters. But the main value of the statistical material is in the preparation of small-scale distribution maps and in the correction of the master 1:1,000,000 map series to be described below.

A word is necessary about the method by which the interpreters trained themselves in estimating "tenths" on the photographs (a method suggested to me by the old quadrant-nephoscope system of estimating cloud-cover). The individual interpreter took in his hand a photograph, and visually estimated the proportion of each cover-type. He then placed over the photograph a fine-mesh rectangular grid, and later a dot-grid of the type used by the forest inventory group. The drill of comparing the guess with the accurate count obtained by means of the grid soon rendered all the interpreters adept at the estimation process. Errors of one or at the most two points in ten may be made on the individual photograph; but these are certainly not systematic as to sign, and the cumulative error over ten photographs - i.e., the unit area - should be negligible.

THE MAP SERIES

Five map series have been prepared as follows:

(i) 1:500,000 (8 miles/inch) cover-type series. (Figure 3) These are the original plotted working maps, prepared by the technique of topographic sketching, along flight lines already described. At present the group does not intend to publish these, but they will remain on file for public reference.

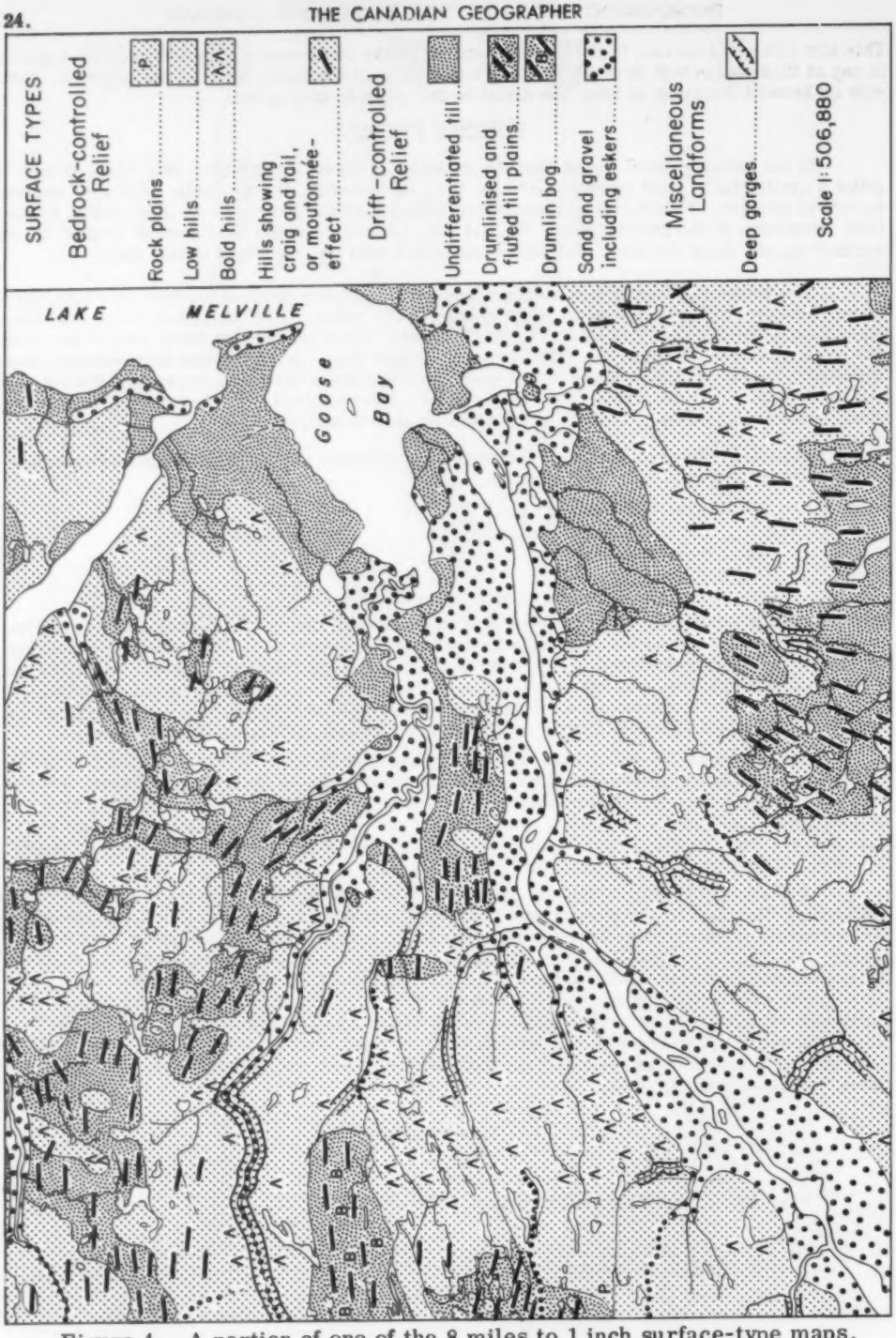

Figure 4. A portion of one of the 8 miles to 1 inch surface-type maps. See text for full explanation of legend.

(ii) 1:500,000 (8 miles/inch) surface-type series. (Figure 4) These maps are the original working series prepared alongside the set (i) just described. They will not be published.

(iii) 1:1,000,000 master cover-type series. (Figure 5) During the past winter (1953-54) the group has reduced the original sketched maps to the 1:1,000,000 scale, and has at the same time corrected the mapping from the statistical data. The cover-type series has been mounted in wall-map form and is shown here. It is hoped to publish these maps.

(iv) 1:1,000,000 master surface-type series. (Figure 6) This is the companion physiographic series to (iii) derived by simplification and reduction from series (ii). These may also be published.

(v) 1:2,217,600 (35 miles/inch) statistical cover-type series. These seven maps show from the statistical data the distribution of the principal cover-type, including open water and burn. The ratio of lichen woodland to closed-crown forest is also shown. These were plotted on the isopleth system; the isopleths all refer to the proportion of the unit areas that have the specified cover-type. These will be presented elsewhere in connection with a discussion of their significance in locating forest boundaries.[1]

GENERAL SIGNIFICANCE OF RESULTS FOR GEOGRAPHICAL RECONNAISSANCE

The methods employed in the preparation of these maps should be applicable without serious modification to other forms of reconnaissance survey. Given adequate coverage of vertical photographs, on a scale appropriate to the task, one can cover huge areas at a reasonable speed. The work so far completed has taken the group about 3,600 man-hours since it turned its attention to small-scale mapping. The area mapped, some 200,000 square miles, is about that of metropolitan France, so that it is clear that a reasonable economy of effort was achieved. Of the 3,600 hours, 1,600 were consumed in the original examination of the photographs, with the topographic sketching of the two 1:500,000 series and the tabulation of the statistical data. The remaining 2,000 were consumed in preparing map series iii-v inclusive and in the writing of sheet-memoirs. These figures are highly tentative, and are put forward only to convey to others planning similar work a rough estimate of the time needed.

The method can easily be extended to settled areas if appropriate keys exist, and if a satisfactory classification of cultural forms can be adopted, an excellent survey should result. C. Raymond (unpublished, private communication) has completed a preliminary survey of the upper St. John Valley of New Brunswick, and A. H. Pattison, a member of the McGill group, is currently attacking the problem by extending our Labrador series south and west from the Lake Mistassini area, across the cut-over and cultivated districts round Lake. St. John. Her plans call for the use of the World Land Use Survey classification in some modified form.

CONCLUSION

It seems, therefore, as if the need for a broader scale of reconnaissance may be met by the use of aerial photographic interpretation. There are few broad distributional problems that defy attack by this method, if it is in the hands of the expert. Too much should not be claimed, however, for the ad hoc case discussed in this paper; we have a very long way to go before we can claim to have achieved real universality in method. But, though we may admit the imperfection of our present methods, we need not be too modest about our objectives. The interpretation of aerial photographs, properly conceived, is a morphological technique of the kind rightly thought central to geographical method by Sauer. The aerial camera is the weapon with which we can discern the real pattern, in a sense the true geography, of the landscape, though we need a high measure of sophistication in their use before we can make this claim a reality.

In the light of our experience, it is possible to suggest a few generalizations about these reconnaissance methods, in the hope that others may be forewarned where the writer blundered:-

---

[1] Hare, F.K., and R.G. Taylor: The Position of Certain Forest Boundaries in Southern Labrador-Ungava, Geographical Bulletin, 8, 1955. In press.

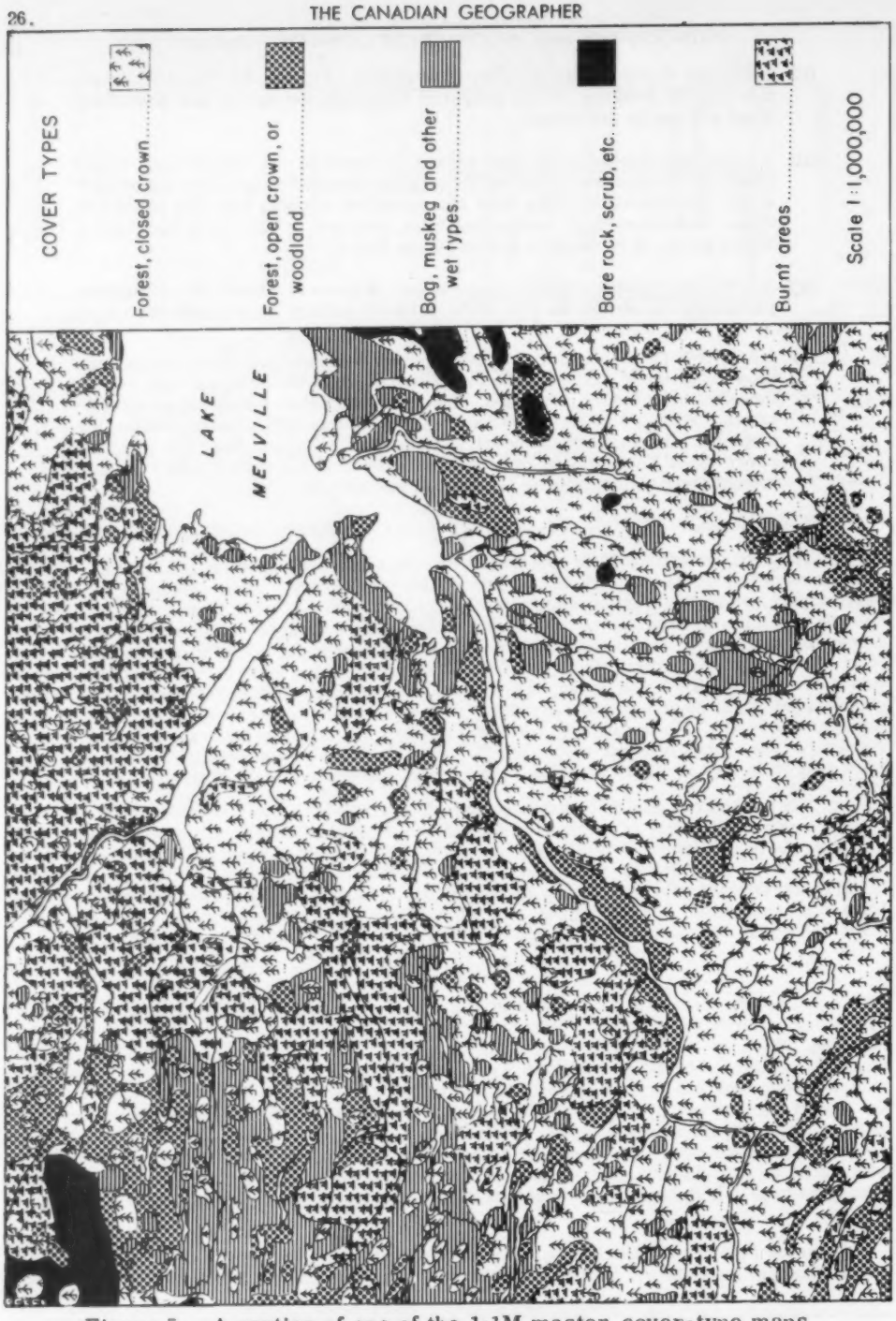

Figure 5. A portion of one of the 1:1M master cover-type maps. See text for full explanation of legend.

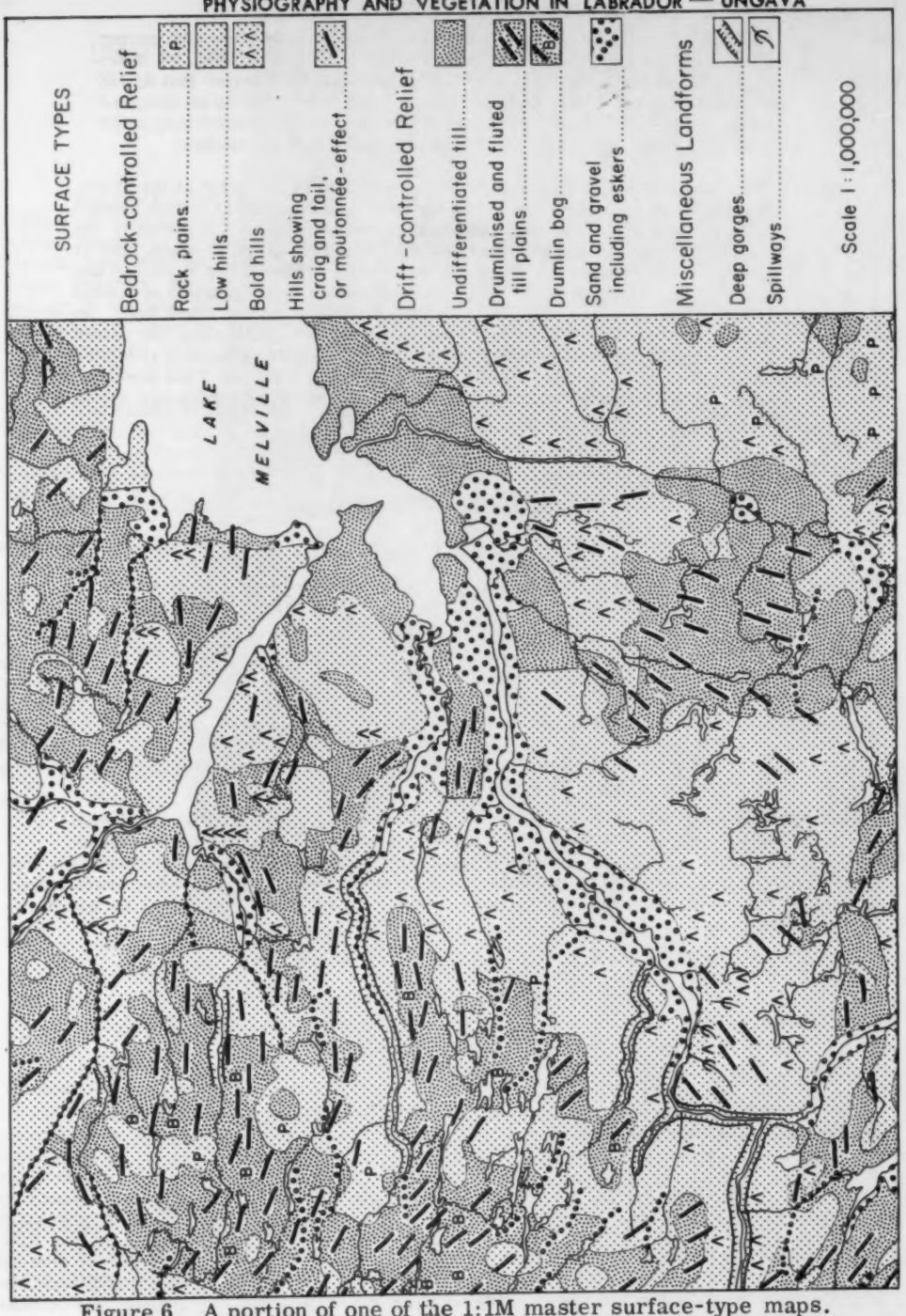

Figure 6. A portion of one of the 1:1M master surface-type maps. See text for full explanation of legend.

1. First, above all, the interpretation keys must be complete and proven effective before mapping can begin. The keys must, of course, be morphological in content - i.e., they should be couched in terms that do not presuppose a particular genetic history - but they must be so designed as to fulfil all probable theoretical demands upon the results they make possible. The keys must, moreover, be based on field studies.

2. The scale of mapping is virtually pre-determined by the scale of the photographs. If the template method is adopted, and if ordinary 9-inch square contact prints are used, then clearly a reduction of 10 to 1 is virtually the limit; for at this reduction, the template orifice is only 0.9 inches, and at smaller sizes it becomes virtually impossible to use. The McGill group has worked with orifices as small as 0.65 inches - a reduction of almost 15 to 1 - but such work is unbelievably tedious. On the other hand, an orifice of more than 2.0 inches becomes difficult to use because one cannot locate oneself accurately enough in the space. This represents a reduction of roughly 5 to 1. In short, reductions of from 5 to 1 to 15 to 1 are possible, but about 10 to 1 is the most suitable scale. These relationships are shown in Table I.

TABLE I

Relationship Between Height of Aircraft and Mapping Scale With a Six-Inch Camera

Height of Aircraft	Map Scale		
	Maximum Feasible	Minimum Feasible	Optimum
5,000	1: 50,000	1:150,000	1:100,000
7,500	1: 75,000	1:225,000	1:150,000
10,000	1:100,000	1:300,000	1:200,000
15,000	1:150,000	1:450,000	1:300,000
20,000	1:200,000	1:600,000	1:400,000
30,000	1:300,000	1:900,000	1:600,000

3. This class of work can be done by people with no familiarity with the region or the landscape type if - and this is a fundamental condition - they have adequate keys, constant supervision (to provide co-ordination of results) and above all a broad familiarity with landscape morphology. In other words they must be scientifically trained and geographically conscious, though they need not be professional geographers.

4. It can only be done effectively in the National Air Photographic Library or some alternative repository of raw materials.

ACKNOWLEDGMENTS

Though I have presented this paper in my own name, I want to make clear that the methods described could only have been consolidated with the willing assistance of my helpers and colleagues. In particular, I should like to restress the debt I owe to Mr. R.N. Drummond for his pioneer work on the interpretation keys. In the laboratory, Miss Anne H. Pattison and Mr. Peter S. Marchant applied the methods described in this paper to the actual mapping process; only their laborious but brilliantly executed work made it possible for us to present so much material at this meeting. The reduction work owes much to the labour of Mr. R.G. Taylor, assisted by Mr. Raymond Montford and Mr. Hugh R. Thompson. Thanks are also due to the National Air Photographic Library, Department of Mines and Technical Surveys, for their willing help, and to Mr. Ivor Bowen, Department of National Defence, for his constant encouragemant.

OBSERVATIONS CONCERNING THE KEEWATIN CENTRE OF GLACIATION

Eric M. Neil and D. F. Putnam

University of Toronto

The central Keewatin sector of the Canadian Shield is apparently part of a widespread surface of erosion, established during pre-Pleistocene time and considerably altered in its surface details by Pleistocene glaciation. Being one of the more remote and isolated parts of Canada, knowledge of its surface patterns has accumulated comparatively slowly. In recent years, however, because of the discovery of economic mineral occurrences, interest in the geology of the area has greatly increased. As a by-product of this interest it appears that a more exact knowledge of the glacial features of the area may also emerge. This brief paper is presented in order to record some observations and ideas resulting from some months spent by E. M. Neil as an employee of a mining company carrying on explorations in the area.

The classical accounts of glaciation in this area are contained in the writings of the veteran Canadian Geologist, J. B. Tyrrell,[1-3] who is, despite his advanced age, still active in a consulting capacity. On the basis of his journeys through the area in 1893 and 1894, he postulated a separate Keewatin glacier. He believed that he could distinguish the effects of three stages of development:

1. An early centre northwest or north of Dubawnt Lake;
2. As the ice thickened, the centre of accumulation shifted to the area between Dubawnt and Kazan Rivers;
3. A late or waning stage during which several local centres were active. One of these was located north of Baker Lake while another was situated on the hills southeast of Yathkyed Lake.

In addition to an impressive list of observations on the direction of glacial striae Tyrrell also identified some of the types of rock in the drift. Around Ennadai Lake he found pebbles of red sandstone and quartz-porphyry similar to the country rock between Dubawnt Lake and Baker Lake. Along Ferguson River also he found red boulders all the way to Hudson Bay. He also cites extensive shore cliffs, bars, beaches and deltaic sand plains, evidence of marine invasion at the close of the Ice Age.

In spite of the evidence brought forward in its support, Tyrrell's hypothesis has not gone unchallenged. From his work in the area about Great Slave Lake area, Camsell[4] stated his belief that the central gathering ground for the great ice sheet lay on the east side of Hudson Bay. R. F. Flint[5] has marshalled the evidence in support of the theory of the single Labradorean centre of glaciation. This theory was accepted and Tyrrell's evidence was not even mentioned in his later book.[6]

---

[1] Tyrrell, J.B.: "Report on Explorations in the Region between Athabaska (sic) Lake and Hudson Bay"; Geological Survey of Canada Annual Report, VII, 1894, pt. A., pp. 38-48.

[2] Tyrrell, J. B.: "Report on the Dubawnt, Kazan, and Ferguson Rivers, and the Northwest Coast of Hudson Bay; and on two overland routes from Hudson Bay to Lake Winnipeg". Geological Survey of Canada Annual Report, IX, 1898, pt. F., pp. 1-218.

[3] Tyrrell, J.B.: "The Glaciation of North Central Canada"; Journal of Geology, VI, 1898, pp. 147-160.

[4] Camsell, C.: An Exploration of the Tazin and Talston Rivers, Northwest Territories; King's Printer, Ottawa, 1916.

[5] Flint, R. F.: "Growth of the North American Ice Sheet during the Wisconsin Ice Age"; Geol. Soc. Am. Bull., 54, 1943, pp. 325-362.

[6] Flint, R. F.: Glacial Geology and the Pleistocene Epoch; Wiley, New York, 1947.

J.B. Bird carried out extensive field work in Keewatin in 1948, 1950 and 1952.[1] In the account of his 1948 expedition[2] he stated: "All the evidence in the Thelon Basin supports a Hudson Bay origin for the ice. Two lobes existed in the area during the latter part of the Ice Age. The first lobe moved from the east-southeast and covered the entire area .... When the first ice lobe had retreated to Schultz Lake its place was taken by a second lobe moving from the south-southeast. The second lobe failed to cover the whole of the Thelon Basin and its western front lay between Aberdeen and Schultz Lakes".

Later[3] by the use of air photographs Bird extended his study to cover the region from the Back River south to the latitude of Dubawnt and Yathkyed Lakes. He concluded that there were at least three distinct ice movements in central Keewatin. The earliest ice advance came from the northeast; the second came from the east and swept the country in a west-northwesterly movement, splitting into two lobes west of Dubawnt Lake, leaving an interlobe ice-free area in which the record of the earlier movement was preserved; finally the area was invaded by ice from the southeast.

W.G. Dean accompanied Bird along the Thelon River in 1948. Later he made extensive examinations of the available air photographs covering a very large area.[4-5] From the extensive occurrences of drumlins and drumlinoids throughout the area he presented an interpretation of ice movements over the "Barren Ground". He supported the ideas of Flint and Bird concerning the movement of ice out of Hudson Bay. However, he admitted that, in the area south of Chesterfield Inlet, which was flooded by marine waters, it is impossible to tell from the air photographs whether the ice movement was from the northwest or the southeast.

In 1952, C.S. Lord and party made a reconnaissance geological survey of Keewatin south of a line running roughly from Dubawnt Lake to Chesterfield Inlet. Accompanying his report[6] is a map of Pleistocene features by H.A. Lee. This map indicates ice movement outward in nearly all directions from a zone extending from Hicks Lake northeastward to Yathkyed Lake, while from here to Chesterfield Inlet the record is one of strong movement from the northwest into Hudson Bay.

The field work on which this communication is based consisted of extensive ground traverses in the area around the north end of Ennadai Lake and in the area about Ferguson Lake together with observations from the air along routes from Churchill to Ennadai Lake, Churchill to Ferguson Lake, Ennadai Lake to Ferguson Lake, Ferguson Lake to Eskimo Point and Eskimo Point to Churchill.

The observations near Ennadai Lake included eskers, undulating terminal moraine, striae and drumlinoidal forms. The general direction of these forms is almost southwest as mapped by H.A. Lee. One esker observed at Ennadai Lake was 75 feet in height.

The area stretching from the north end of Yathkyed Lake eastward to Ferguson Lake and the west end of Kaminuriak Lake is just north of the limit of mapping as drawn by H.A. Lee. The alignment of glacial features in this area, however, shows a southeasterly trend which is in agreement with the mapping a little further south. Roches moutonées near Ferguson Lake displayed smoothed, scoured ends toward the northwest and plucked surfaces to-

---

[1] Bird, J.B.: Southampton Island; Queen's Printer, Ottawa, 1953.

[2] Bird, J.B.: "The Physiography of the Middle and Lower Thelon Basin"; Geographical Bulletin, 1, 1951, pp. 14-29.

[3] Bird, J.B.: "The Glaciation of Central Keewatin, Northwest Territories, Canada"; American Journal of Science, 251, 1953, pp. 215-230.

[4] Dean, W.G.: Physiographic Regions of the Barren Grounds; M.A. Thesis, (unpublished), University of Toronto, 1950.

[5] Dean, W.G.: "The Drumlinoid Landforms of the Barren Grounds, N.W.T."; The Canadian Geographer, 3, 1953, pp. 19-30.

[6] Lord, C.S.: Geological Notes on the Southern District of Keewatin, Northwest Territories; Geological Survey of Canada Paper 53-22, Ottawa, 1953, pp. 1-11.

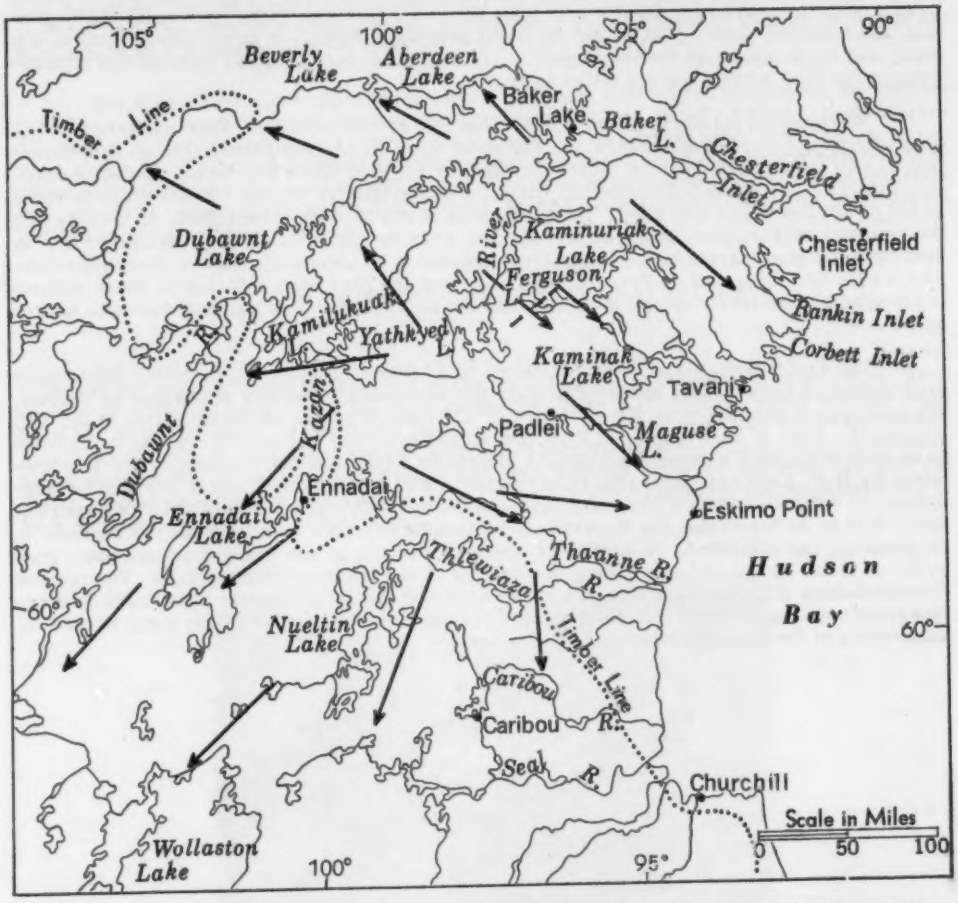

Figure I. THE STRIKE OF GLACIAL LANDFORMS IN CENTRAL KEEWATIN
Compiled from separate maps of J.B. Bird, H.A.Lee, and C.S.Lord.

ward the southeast. The till and the erratics in the area around Ferguson and Kaminuriak Lakes contain a great deal of red porphyry and red quartzite, rocks which were mapped by Tyrrell some distance to the northwest. There seems to be no source of these rocks to the southeast. The drift also contains fragments of a conglomerate and volcanic tuff whose origins are presently unknown.

Hills near Ferguson Lake rise some 350 feet above the level of the lake or some 700 feet above sea-level. On some of them may be seen on a small scale almost all the characteristic features of alpine glaciation. Examination of one valley disclosed that it had a typically stepped profile as though cut by a valley glacier. Miniature cirques may also be noted. Even now certain valleys in these rocky hills have rock glaciers, lightly covered with vegetation, but definitely moving as shown by basal pressure ridges. It would appear that at one time, and presumable, in the latest phases of the glacial period, these uplands had an independent ice cap, several square miles in area.

When the ice melted the waters of Hudson Bay swept far inland. This submergence has been reported by Tyrrell and others. At Ferguson Lake the highest identifiable marine shoreline was 60 feet, approximately, above the lake, or 410 feet above sea-level. Lee states that, at a point 25 miles south of Kaminuriak Lake, the upper limit of marine submergence is found at 595 (+50) feet above sea-level. This difference is not at present explained. It may be that the area around Ferguson Lake was ice-covered when the higher beach was formed or it may mean that a higher marine beach in the area remains to be identified. Higher shorelines elsewhere have been reported by Tyrrell, Bird and Lord and have been referred by these authors to pro-glacial lake levels during the time when the usual drainage to the northeast was barred by ice.

The controversy concerning glaciation in Keewatin remains unresolved. While later work seems to have thrown some doubt upon the succession of events postulated by Tyrrell, the challenge to his theory of the existence of a Keewatin centre of accumulation is not well supported. Most of the evidence of Bird, Dean, and even that of Camsell, can be interpreted in support of Tyrrell's general hypothesis almost as well as to the contrary. The map prepared by H.A. Lee[1] appears to be most definitive and authoritative, but it needs to be augmented by a detailed description and analysis of the methods and criteria used in its construction. It is to be hoped that the Government of Canada will soon authorize such a memoir to be prepared and published. In particular there is needed, in the critical areas, some good evidence from the ground concerning the origins of the transported materials. The correct interpretations of the surface features of any area and the establishment of the pattern of ice movements during the final phases of glaciation are, however, only the first steps toward the unravelling of the complex history of the Ice Age.

---

[1] In Lord, op. cit.

CULTURAL CONFLICT IN THE CANADIAN ARCTIC

George H. Michie and Eric M. Neil

University of Toronto

In recent years Canadians have begun to look upon the north with new appreciation, for seemingly vast and, as yet, little known resources are being unveiled. For many years a few enterprising men have traded in the north, buying furs, selling supplies and creating profits for investors in more southerly lands. The fur-trade is waning but its place is being taken by new companies which are exploring the north with a view to exploiting its mineral wealth. This new movement into the north threatens to engulf the native population which must either be integrated into the changing scheme or be cut off from the development and left to forage for themselves on a depleted resource base.

For several summers while in the employ of mining exploration companies, the authors have been able, separately, to observe the native populations, chiefly Eskimo, in the Ungava Bay region of Quebec and in the interior of Keewatin. On comparing these first-hand observations it was found that, while there are dissimilarities, there are interesting similarities between the two regions and increasingly urgent problems to be solved in both. The purpose of this paper is to summarize these observations, to make comparisons, to state the problems and to suggest possible solutions.

THE ESKIMOES OF THE UNGAVA BAY REGION

Previous to 1900 the coastal Eskimoes of the Ungava Bay region sealed and fished the waters of the Bay and hunted the barrens inland for a distance of over two hundred miles. They were self-sufficient people, trading seal, white fox, otter and muskrat skins with the local Hudson's Bay Company Posts at Payne Bay, Leaf River, Fort Chimo, Whale River and George River. After 1900, the Naskaupi Indians encroached steadily upon the Eskimo hunting grounds, which were unable to support both groups and soon became severely depleted. In 1953 the Federal Government moved the Indians back to their former habitat in the neighbourhood of Fort McKenzie on the Kaniapiskau River.

Figure 1. Typical Ungava Eskimo home scene. The home-made canvas tent is supplied with a low wooden door. The stretcher is being used to stretch the skin from a seal taken in Leaf Bay.

The Ungava Bay Eskimoes have been in contact with the Hudson's Bay Company since 1828 and have become members of the Church of England since 1890 when they were first visited by an Anglican missionary. For various reasons their culture had undergone a gradual modification. The methods of hunting have changed following the introduction of the rifle; both the caribou and the fur-bearing animals have become scarce and as a result the natives have become dependent on imported foodstuffs, clothing and other trade articles. Therefore, the Eskimo tend to concentrate around the trading posts instead of living in widely scattered family encampments. Indicative of an altered situation, too, is the fact that only two trading posts, Payne Bay and Fort Chimo, remain active of the seven which in the 1920's were operated in the region by the Hudson's Bay Company and Revillon Frères.

The unit of social organization is the family. There are no tribes, or tribal chiefs, but older and wiser individuals may be deferred to in matters concerning a group of families. Most of the people are Anglicans and follow their church ritual regarding birth, marriage and death. More recently Roman Catholic missions have been established at Payne Bay and Fort Chimo.

The Ungava Bay Eskimoes are husky people, both men and women ranging from five feet two inches to five feet six inches in height and weighing about 140 pounds. Despite their robust appearance, however, they are susceptible to tuberculosis and they have low powers of resistance against influenza, measles and common cold. In the past fifteen years the death rate from epidemic diseases has been alarmingly high. Since 1951 several severe epidemics have resulted in the death of more than 130 people out of a population of approximately 600 in this area.

Ungava people marry in their mid-twenties, the partners being indispensable to one another in the nomadic life which each family follows for the greater part of each year. The husband provides food for the family and supplies the raw materials which the wife makes into wearing apparel. An average family appears to consist of the parents and three children, but several children have been born and died and frequently the first wife has also died before this average is attained. Under the rigorous Arctic conditions the survival rate of mothers and newborn children is rather low.

Figure 2. Ungava Eskimo boys with their dogs and kayak. Notice the extent to which imported textiles have replaced native skin clothing. The boy at the back wears manufactured garments while the other wears home-made clothes cut from materials purchased at the trading post.

In place of the vanished caribou, seals now provide the basic food for the Ungava Bay people, supplemented by Arctic char, a fish of the salmon family which is valued because of the fat which is interlayered with its flesh. The annual migrations of the people are adjusted to the seasons in order to be at the best hunting and fishing sites at the proper times. These movements are restricted to the coast during seal hunting, proceeding up the major river

valleys, where the fish migrate to spawn in August and September, and where shrubs and trees provide fuel. The Hudson's Bay Company posts are the bases for the Eskimo settlements, from which the annual movements are made.

The shelters used by these people the year around are tents designed and made by the women from materials obtained from the Hudson's Bay posts. Igloos are used on short hunting trips in winter. Summer clothing consists of garments, either purchased ready-made or sewn from materials obtained from the trading post. In winter sealskin parkas and trousers may be worn instead of cloth garments. The typical outfit consists of parka, trousers, and knee boots. Sealskin boots sewn with sinew are used throughout the year.

Figure 3. Inside an Ungava Eskimo tent. The bannock cooking in the frying pan illustrates the use of wheat flour to supplement the meat diet. The frying pan, the stove, the lantern, the sewing-machine and other trade articles are used instead of the old native hand-made equipment.

The adoption of the repeating rifle and the decline of fur-bearing animals have resulted in the loss of old hunting skills since there is now little opportunity for them to be put into practice. Fewer seals are actually recovered when a rifle is used instead of the harpoon and rope. The depletion of the caribou, however, appears to be the result of encroachment by the Indians whose hunting technique is more wasteful, as well as the effect of the use of modern fire arms in the hands of the Eskimo.

Winter transportation, from October to June, is furnished by dog teams hitched fanwise behind the Eskimo sled. The harness is made from sealskin strips and five or six dogs comprise a team. Summer travel is limited to the waterways using coastal craft up to 40 feet in length. Kayaks and canoes are used on the rivers.

ESKIMOES OF THE KEEWATIN DISTRICT

The Caribou Eskimoes of Keewatin constitute one of the most primitive groups. They number approximately 400 persons, all living inland and being entirely dependent upon the caribou for their livelihood. Their first contact with the white man was at trading posts within the timber line where they came occasionally to trade. The first reported visits to these people were made by Lt. Schwatka[1] in 1889 and J.B. Tyrrell[2] in 1893-94. There was apparently no further contact until the 1920's when the demand for Arctic fox furs caused a number

---

[1] Schwatka, F.: The Neitschilluk Innuits; Science, IV, 1884.

[2] Tyrrell, J.B.: Report on the Doobawnt, Kazan and Ferguson River Systems and Northwest Coast of Hudson Bay; Geol. Surv. Can., Ann. Rept., New Ser., IX F, pp. 1-128, 1896.

Figure 4. An elderly Ungava Bay Eskimo. The only fur on his costume is the trim on his cotton parka.

Figure 5. An Eskimo of the Keewatin interior. His caribou-skin parka cannot be matched by manufactured garments.

of trading posts to be set up, but with the ensuing decline in fur prices most of these posts were soon withdrawn. During this period the area was studied by Danish scientists who made extensive reports on these people. The Caribou Eskimo were also visited by missionaries but, on the whole, their culture has been very little modified by contact with the white man and their life continues its simple, primitive pattern. There is no tribal organization. The family is the only unit but when a group of families lives together, an older man who is a better hunter may, to a limited extent, direct the affairs of the camp.

Their religion consists of a shadowy belief in spirits and ghosts; there are no priests and only a few people whose spiritual powers are believed to be more efficacious than those of others.

Relations between man and woman are on a similarly simple basis. A mate is picked but if the union proves to be unsatisfactory the partnership is broken and new ones are formed; however, this is not too often the case. A good hunter who can support a large household may be polygamous, while polyandry may also occur. Children of a broken household are gladly adopted by either of the new mates or by other persons of the community. An example is the child, Ikileagh, of the Ihalmuit group, who was adopted by Koyak but who lived alternately with the households of Hallo and Yaha. Child abandonment and suicide of older folks still occur but only in cases of direct necessity and with as much accompanying distress as in one of our own families, for the Eskimo loves his children and his parents dearly.

The Caribou Eskimoes are stocky people, about five feet two inches to five feet four inches in height and about 140 pounds in weight. Normally they are fairly healthy, their greatest hazard being starvation, a frequent occurrence in the camps. They are very susceptible to introduced diseases such as polio, pneumonia, influenza and measles. Tuberculosis is quite common, particularly among the women.

The caribou provides almost the entire resource base for these people. The meat is virtually their only food, while from the skins are made their tents, clothing, kayaks and pack sacks; the sinews furnish thread and fishing lines and intestines become ropes and dog harness. The skin tent is still used in summer, but has been partially replaced by the canvas tent, while

in winter the igloo is the universal home. Both tent and igloo have similar internal arrangements with the communal sleeping robes on the side opposite the door and other household goods arranged around the walls. A crude stove made from an oil drum may sit near the door, while in winter the sole source of light is a lamp fueled with caribou fat. The clothing is almost entirely of caribou skin, two suits being worn in cold weather, while in summer only the inner suit, the one with the hair turned in, is worn. Summer wear may include some woollen goods, depending on the wealth of the family.

Figure 6. Strips of meat drying on the racks and caribou hides littering the ground at an encampment of the interior Keewatin Eskimo at Ennadai Lake.

Figure 7. The Keewatin Eskimo tent is a round skin-covered structure supported on poles.

The number of caribou needed to support the average family varies widely. Among the more provident, it is about 125 per annum, but others are more wasteful and kill many more animals. The number of dogs to be fed, the skill of the hunter and the number of shells he has available are some of the factors involved.

Caribou are migratory. In May, loosely assorted herds, composed largely of females, leave the timberline to enter the barrens. It is upon these that the hungry Eskimo hunter falls, killing not only the does but the yet unborn calves. Hunting techniques are simple, it being necessary only to approach downwind and remain still. The caribou has poor eyesight; to intercept a herd the Eskimo has merely to sit down and wait for it to pass by. When it arrives he fires an many times as possilbe before panic seizes the herd. Caribou do not seem to associate the sound of a rifle with death so it is possible to shoot several before they panic. Caribou meat is dried to preserve it for future use.

Much of the caribou meat is fed to the dogs, each Eskimo family keeping from six to twelve huskies to furnish winter transportation. Recently, however, the dog population has been drastically reduced through starvation and the ravages of the dog-fox disease.

The pattern of Eskimo migration is quite irregular, being varied for almost any reason. Formerly they travelled widely going to Beverly Lake to trade and south to posts in the timbered country. Almost constantly on the move, their main routes lie along the larger rivers and lakes. In summer they travel by kayak or on foot but the greatest distances are covered in the spring, by komitik, when the people regroup to await the coming of the caribou. The general pattern of their movements, then, is a loose agglomeration on the caribou route in the spring followed by a gradual drifting apart through the summer toward winter trapping areas and a reunion once more in the spring.

Some of the Caribou Eskimo seem relatively prosperous but most of them are quite poor because of the low prices for fox pelts. Their woes are being increased as the caribou become scarcer and harder to find, especially in the spring when the people are near starvation. The size of the earlier Caribou Eskimo population is a matter of dispute. From the varying reports, however, it must be concluded that their numbers have greatly decreased since 1900 and they may well be on the way toward extinction.

REGIONAL COMPARISON

Linguistically and physically these groups of Eskimo people are similar. Reasonably well adjusted to their environment they were healthy until they came in contact with Europeans from whom they contacted a number of serious diseases against which they apparently have no natural immunity.

Because the Ungava Bay people are coast dwellers and the Caribou Eskimoes are an inland group there is considerable difference in culture. Formerly the Ungava people also depended to a considerable degree on the caribou as well as on their sealing and trapping industries. The Caribou people have always been almost entirely dependent upon the caribou and still are dependent upon them, although tea and ammunition are obtained at the trading posts in exchange for fox pelts. Both groups are trying to live on a depleted resource base. The caribou have all but vanished from Ungava and are decreasing to the west of Hudson' s Bay while fur-bearing animals have been depleted in both areas. Both are suffering from the decline in fur prices and their consequent inability to obtain trade goods.

Family organization is similar in both areas but the family dwellings are quite different. The Ungava people live in canvas tents the year round but may use igloos during short winter trips. The Fort Chimo Eskimoes, however, have forgotten how to build snow houses. The Caribou Eskimoes use skin tents, and occasionally canvas tents in summer, while they all use igloos in winter.

The greatest cultural differences are due to contact with people of European origin. In the Ungava Bay region this dates from 1828. Through the efforts of missionaries the Christian religion has become common, while the chief settlements have been attracted to the trading posts. Many Eskimoes found seasonal work with the Hudson' s Bay Company in former years. After 1940 they were employed at the airport and in recent years the mining companies have found them useful. The Caribou Eskimo of Central Keewatin have not had the same opportunities.

URGENT PROBLEMS

Increasing contact with the newcomers in both Ungava and Keewatin, however, threatens these people with the complete loss of their culture if not with virtual extermination. In some way they must be integrated into a changing order while at the same time preserving their individuality, their integrity and some of the useful traits of their culture. Some way must be found to increase their resistance to disease, to educate them and to provide them with a wider resource base. Without an assisted, gradual assimilation, the alternatives would be to force them to retrogress to the old way of life in areas reserved for them or to engulf them in the new settlements and allow them to become adapted or to disappear. Reservation life would be painful and probably impossible on the resources presently available. The process of submergence in a new community would lead to extermination.

Why should we worry about the fate of the Keewatin and Ungava Eskimoes? The Federal Government has formed a new department focusing attention on northern affairs. There is concern over northern settlement, both in regard to possible defence requirements and in connection with the development of resources.

What role can the Eskimo play in the development of the north? It appears that they could be a small but valuable labour force; they have considerable mechanical ability and

sufficient intelligence to assimilate training. Since they are acclimatized to northern conditions and do not want to live anywhere else, they should be able to settle and develop the Canadian Arctic more efficiently than white men. Eskimo settlements adjacent to exploitable areas might make conditions more attractive to white settlement.

There is a further consideration. The Eskimo people who are still happy, strong, independent and reliable in spite of adversity, should be helped to survive for purely humanitarian reasons. We have a moral obligation to help them since their economy has almost been destroyed by the use of white man's weapons and because their health has been affected by disease and foodstuffs introduced by the newcomers.

CONCLUSIONS

How can we resolve the cultural conflict? To the authors it seems clear that the natives should be integrated into the changing scheme of things while at the same time preserving their best cultural traits. To make this possible there are several matters to which it is recommended that attention be given.

Improvement of the Resource Base

In view of the great decline in the native caribou herds a grazing industry should be established to provide the north with a stable food base and to furnish an independent, economic activity for the natives. The plan would be to make these regions self-sufficient but not necessarily exporters of surplus meat, since to do so would probably overtax the range.

Suitable animals would be reindeer and muskoxen. The reindeer has been introduced in the Mackenzie Delta with only moderate success, since the natives of that area are already the wealthiest in the Canadian Arctic because of the availability of fur-bearing animals in that region. In Keewatin and Ungava no such alternative, abundant resource exists to hinder the development of herding. Muskox herding has never been attempted but it was strongly recommended by the Royal Commission of 1922 and by more recent government investigators. Much work, however, needs to be done to determine the carrying capacity of the ranges. The introduction of grazing animals would not be an innovation but an attempt to restore the resources of these regions. The diet of the people would then be as adequate as it was before the white man introduced non-indigenous foods. With plenty of meat and the addition of certain dietary supplements, the general health of the people would be improved and their resistance to disease increased.

Caribou and reindeer skins furnish the best possible clothing, being light and warm and infinitely superior to anything yet produced artificially. Dog harness, tents and bedding are made from caribou skins while the best footwear is made from sealskin. As well as meat, the muskox could supply sleeping robes, excellent wool which may be spun and woven, and horn from which many useful articles may be made.

Improvement of Health

Eskimo people do not entirely lack resistance to disease but their resistance has been steadily lowered by an increasingly deficient diet. As a result they are susceptible to communicable diseases while the chances of infection have increased through more frequent contact with newcomers. Since 1950 there have been alarming epidemics. At Fort Chimo alone, 65 people died of measles in the winter of 1951-52. The following winter 70 persons died in the southern part of the Ungava Bay area during a severe epidemic of influenza. It has not been possible to give the Eskimoes a complete course of innoculations to make them immune to these diseases because their resistance is so low that to do so in some cases might result in infection. Their diet must be improved to make up for deficiencies in order that they be given scientific protection against disease.

There is a high incidence of tuberculosis among the Eskimoes, particularly among women who are weakened by childbirth. Life in tents set up on damp ground seems to make them particularly susceptible. However, when they were able to get all the red meat and fats that they could eat they were robust and active. Measures for health improvement cannot be put off for consideration at some future date but must be undertaken now while there are people still able to derive benefit.

Housing

Most of the Ungava Bay Eskimoes use tents the year round. In winter a double tent is used. Tents are light, roomy and warm and, since they are portable, they are never left in one place long enough for the site to become contaminated. The summer tent of caribou skin and poles used in Keewatin is not so weatherproof or light and therefore not so desirable as the canvas tent. Igloos are used in winter, particularly at Payne Bay and among the Caribou Eskimoes of central Keewatin. They are easy to build and are frequently replaced by new ones. Sanitation is thus no problem.

At present it is not wise for Eskimoes to live in permanent habitations such as those at Fort Chimo because of their ignorance of the principles of sanitation.

If the people of Ungava and Keewatin are to become herders, they must continue to be nomadic, retaining the use of tents and igloos. Those, who are to be employed at the settlements, must be provided with permanent homes and taught proper sanitation methods.

Employment

Are the Eskimoes adaptable to new forms of employment? There is no doubt of their reliability and mental ability, the problem is whether they are able to make the necessary adjustments. Some of the Eskimoes in Keewatin and Ungava are potentially valuable as a small permanent labour force living permanently in those areas. Should these people be encouraged to become more dependent on mining or other activities where there is a chance that they may be abused, or should they be encouraged to live independently, producing some of the supplies needed by the mining concerns? It is probable that the Eskimoes should be encouraged and aided to do whichever they wish. However, they must be educated for the new positions. The white men who will be in authority require education even more than the Eskimoes, in order to avoid possible abuses.

In Ungava a small number of Eskimo men are employed as unskilled labourers by the mining concerns, the Department of Transport and others. Some of these men, because of inherent mechanical ability, could be trained to do more skilled work. During the long winter, when activities in the region are at a low ebb, the men would be very valuable in a maintenance capacity. At the present time, however, most of those in the Ungava Bay region and all those in Keewatin cannot do even unskilled work without direction because they have not sufficiently adjusted themselves to the changing conditions.

Should the more adaptable individuals be allowed to leave the Eskimo community to take other employment where they are needed, in order to give an example to the rest? There will be no problem with the future generation which will be brought up under a changed situation but, in Keewatin and probably in Ungava, it might be better not to try to advance the Eskimo too quickly. There are other possibilities of employment for these people. Larger populations in these regions could absorb the products of native industry. If the Eskimoes were employed in herding, fishing, sealing and trapping, they could produce meats, fish, furs and hides for the use of the new population, instead of exporting any of these items through trading posts as they do now. The women could continue to manufacture the incomparable clothing which is peculiar to the region and already is recognized as superior and eagerly sought after by the newcomers. Such employment would permit them to continue their nomadic way of life and help to prevent the loss of their identity. These regions should not be expected to produce a surplus, but might be expected to be reasonably self-sufficient for the small permanent population which will live there eventually.

Education

In neither region has the Eskimo had any formal education. There is a fairly widespread knowledge of the syllabic script, learned from the Anglican missionaries and handed down from generation to generation. Formal education is difficult for nomadic hunting people. If they were nomadic herders, the children might more easily be left in residential schools for part of the year. As it is, the children cannot be separated from families for, if they were, they would not learn how to subsist and would eventually become dependent on Federal Government welfare payments.

The Eskimoes need to learn English in order that they may live with white men and not be abused by them. They require an elementary knowledge of mathematics and an understanding of our monetary system so that they may be able to trade more easily. Their own language and writing should be preserved in order to promote communication amongst all Eskimo groups and facilities for higher education should be made available to those who desire it. The proposed new herding economy will require that instruction be made available on the care, feeding and selection of breeding stock before it can be successful.

Newcomers must also be educated in order to understand life in the north. The Eskimoes may be accepted by small groups but may tend to be segregated by larger groups of newcomers which include women. In such cases the social order tends to become rigid, leaving no place for the native. For the most part, the permanent white population in the Arctic lives on amicable terms with the Eskimoes, but the large floating population to be expected in the future may pose a more serious problem.

SUMMARY

The exploitation of the Canadian Arctic by people of European extraction has meant profound disruption to the culture of the indigenous Eskimo people. Through the fur-trade they were provided with efficient weapons with which they have rapidly depleted their resource base. From the white man, also, have come many diseases which have ravaged and reduced the natives themselves. A new era of northern development is now beginning in which the mineral resources are about to be exploited. In it the Eskimo cultures of Ungava and Keewatin face their most severe testing time. The Eskimo can be a useful workman. If the whole population migrates to the new settlements, the younger generation will not learn the old ways so that the culture, and probably the race as well, will disappear.

On the other hand, through proper attention to health, housing, education, conditions of employment and improvement of the resource base, it should be possible to integrate the Eskimo into the new order. Some of them may be educated to fill very useful places in northern industries while, at the same time, the old culture may be continued and improved by others who develop a new herding industry on the tundra from which the caribou have vanished.

In the present global situation, there is some worry about the lack of population in the immense northland. For economic and political, as well as humanitarian reasons, Canada is compelled to face the problem of Eskimo survival and to attempt to provide a solution. In any event, the human geography of the Canadian Arctic is being rapidly recast.

IRON ORE PRODUCTION AT KIRKENES, NORWAY

Trevor Lloyd

Dartmouth College

Kirkenes is a Norwegian iron ore port on the southern side of Varanger Fjord close to the Norwegian-Soviet border. In latitude, 69° 44' N., it is roughly equivalent to that of Disko Bay, Greenland or Point Hope, Alaska, and its longitude, 30° 03' E., puts it due north of Alexandria, Egypt. Kirkenes lies about 220 miles north of the Arctic Circle and 130 miles farther north than the better known mining town of Kiruna in Sweden. Distances to Kirkenes by sea are a significant factor since practically all its freight and passenger traffic moves by ship. Typical distances are shown in Table I.

TABLE I

Distance of Kirkenes from Selected Ports

Port	Distance (miles)
Oslo, Norway	1,450
Newcastle, England	1,500
Hamburg, Germany	1,600
Boston, Mass., U.S.A.	4,500

The sole justification for Kirkenes as a well-equipped seaport and settlement of about 3,800 people is the occurrence a few miles inland of large iron ore deposits.

The northerly location of Kirkenes may give a misleading impression of the severity of the local climate and the harshness of conditions under which mining, shipping and general living must be carried on. In fact the Kirkenes climate is surprisingly mild.

TABLE II

Mean Temperatures (°F.) at Kirkenes, Norway, 1861-1920

Month	Temperature	Month	Temperature
January	12.2	July	53.1
February	11.1	August	51.3
March	17.6	September	43.7
April	27.7	October	32.4
May	36.7	November	21.0
June	46.6	December	14.0
	Yearly Average 30.6		

The mean maximum temperature is 78.3° F., the mean minimum is 24.9° F. The first date on which the average temperature exceeds 32° F. is May 1st, while the first date on which average temperature falls below 32° F. is October 17th. The annual precipitation totals 14.7 inches with a summer maximum and there are 210 days with snow-cover.

Stations even a few miles inland have more severe conditions - with the warmer summers and cooler winters typical of less maritime conditions.

Length of daylight is an important factor in mining and shipping operations and has a direct effect on the demand for electrical power. The long winter night in such latitudes is, however, not as great a factor as is often supposed. Thus, although the sun does not rise at Kirkenes from the last day of November to January 14th, the period when there is complete darkness for the twenty-four hours is much shorter than this, and depends largely on the degree of cloudiness. Thus "twilight" never falls below four hours a day even in mid-winter, and the snow-cover increases its usefulness. By contrast the sun does not set from mid-May tc July 24th and there are in all about 108 days at least with twilight throughout the night.

The sea does not freeze in Varanger Fjord, and even inshore in the inlets close to Kirkenes the ice is seldom more than a few inches thick for a few weeks each year. A true ice-breaker is not needed, as any thin ice is removed from around the wharves by the local pilot boat. Vessels using the harbour need not be constructed to navigate ice. Fresh-water lakes, on the other hand do freeze. The fact that sea-water temperatures are relatively low in summer and close to freezing in winter is an asset since the water is used in steam condensers in the local electrical power plant.

Kirkenes is a remote spot. It is not connected to the European rail network, and in winter Route 50, the gravel highway which links it to southern Norway is blocked by snow at several points. The sole dependable connection with the outer world is therefore by sea, and the town and the mine must depend on the sea for all their needs, apart from small amounts of food and lumber produced locally.

THE IRON ORE DEPOSITS

The Kirkenes iron ore occurs on a peninsula between a long narrow arm of the sea (Langfjord) on the west and the valley of the Pasvik River on the east, and from 100 to 170 metres above sea-level. The nearest deposit to Kirkenes is about five miles south of the town. The whole field is about seven miles by three miles, but present workings are in a limited area near a lake, Bjórnevatn (Bear Lake) which gives its name to the nearby mining settlement Bjórnevatn. Other deposits are farther south. The mine workings are within sight of Soviet territory about two miles to the east. Interestingly enough, when standing on a hill not far from the mine, it is possible to see, fifteen miles to the south, the tall chimney of the Soviet nickel smelter at Salmijärvi, and during the winter, the lights of the two mining settlements can readily be seen from each other. It was while searching for an extension of the Bjórnevatan iron ore fields across the international border in what was then Finland, that the nickel deposits were discovered.

The Bjórnevatan iron ore occurs in metamorphosed sediments of middle Precambrian (Karelian formation) age in an area which has been intensely folded. The ore itself is overlain and underlain by gneisses. The series is bounded in some directions by faults and elsewhere by granite. The ore now being worked is in a steeply dipping fold cut by faulting and intruded by dykes. It forms a rough V-shape, pointing northward. As the map shows (Figure 1) the width of ore varies greatly. The area exposed by the present open pit covers about three-quarters of a mile by half a mile. An intensive program of geological exploration is continuing in an effort to outline accurately the extent of the various deposits. This is essential if an economical method of extracting these low-grade ores is to be worked out.

The mining company holds title to an area about thirteen miles by three miles, which includes the ore fields, Bjórnevatn, the mining settlement and also the Kirkenes townsite.

The Bjórnevatn ore now being mined is extremely hard magnetite inter-laminated with quartz with a relatively low iron content, and closely resembles the Minnesota taconites. A typical specimen shows from 34 to 37 per cent of total iron. About 30 to 32 per cent is magnetite and about 44 per cent quartz. The sulphur and phosphorus content is extremely low. When compared with the Minnesota taconites, the ore is slightly richer in magnetite and somewhat more crystalline. However, the two are so similar that experience gained in operating the Norwegian field can be applied directly to the benefit of taconite mining in the United States.

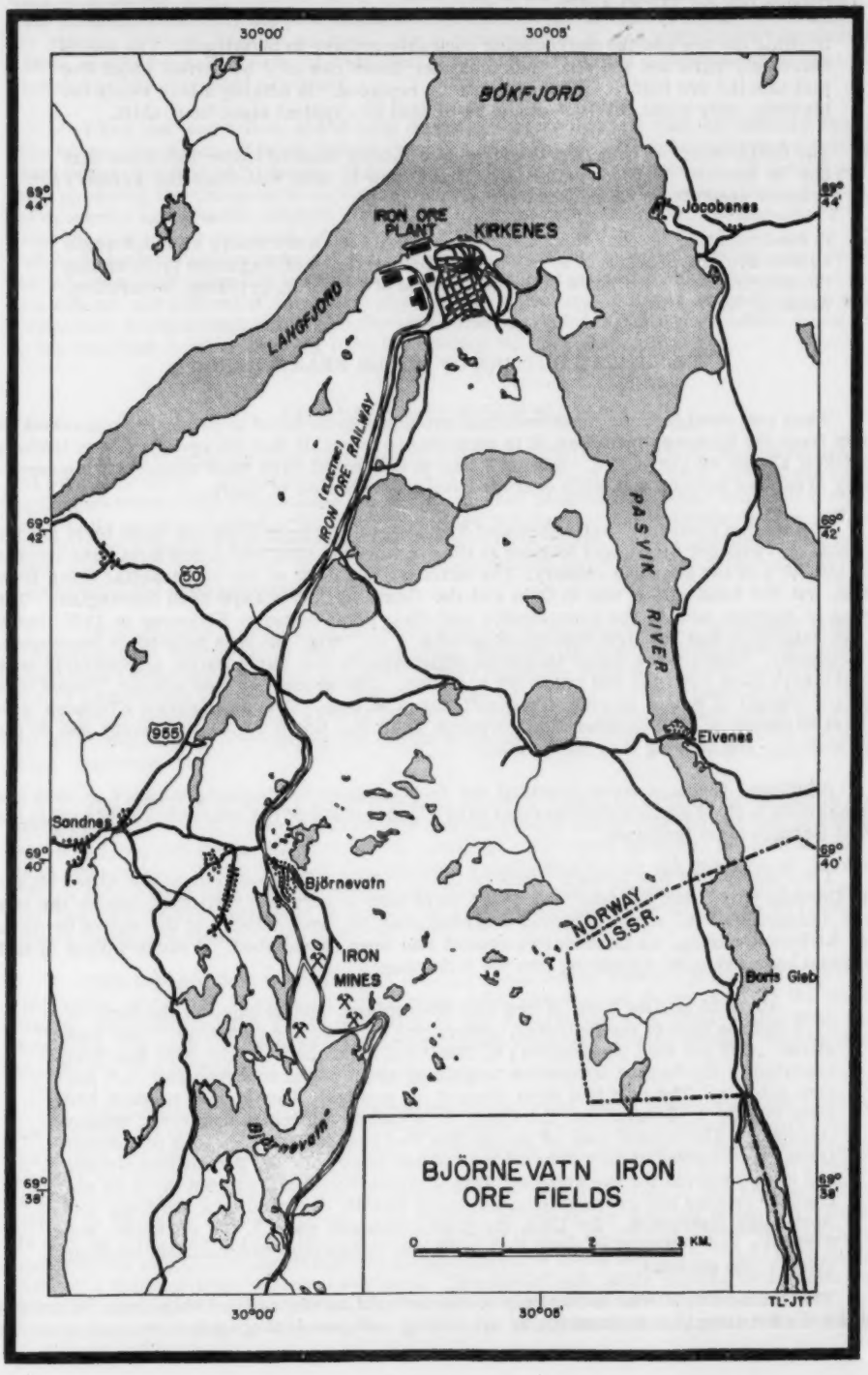
30°00'
30°05'
BÖKFJORD
69° 44'
IRON ORE PLANT
KIRKENES
Jacobenes
LANGFJORD
IRON (RAITIE) ORE RAILWAY
PASVIK RIVER
69° 42'
50
955
Elvenes
Sandnes
69° 40'
Björnevatn
NORWAY
U.S.S.R.
IRON MINES
Boris Gleb
Björnevatn
BJÖRNEVATN IRON ORE FIELDS
0 1 2 3 KM.
69° 38'
TL-JTT

Figure 1.

From a production viewpoint, the chief problems to be faced in mining and processing the Bjørnevatn ore for export are:-

1. Drilling the ore and the surrounding rock preparatory to blasting it. The ore is extremely hard and the nine-inch diameter holes can only be driven about five feet into the ore before the bit needs to be replaced. In making a hole ready for blasting, only about fifteen feet can be drilled in a typical eight-hour shift.

2. The initial stage of breaking the large ore blocks blasted loose, into sizes that can be handled by the crusher is difficult, and to deal with them the primary crusher needs to be exceptionally heavy.

3. In concentrating the ore to raise the content of iron and remove as much waste as possible, the problem is to extract the fine particles of magnetite from among the quartz. This requires a complex process of crushing, grinding, separating, washing, drying and so on.

HISTORICAL OUTLINE OF MINING NEAR KIRKENES

When one considers the many technical problems to be faced in producing a marketable product from the Kirkenes taconites, it is remarkable to recall that the operation was initially undertaken almost 50 years ago. Nowhere else in the world have such apparently unprepossessing ores been worked with such success over a long period of years.

The mining company "Aktieselskabet Sydvaranger" (named from the local term for the land south of Varanger Fjord) was founded in 1906 to work the ores which had first been located in the late 60's of the previous century. The initiative and most of the early capital came from Sweden, but the head office was in Oslo and the Company has always been Norwegian. The building of harbour works, the concentrator and other plant began at Kirkenes in 1907, but it was not until 1910 that the first fine black powder - or "slig" as it is termed in Norwegian, was produced. There were many technical difficulties in the early years, particularly with the machinery used to crush and grind the hard ore. The product, a fine powder, mixed with a certain amount of water, proved a difficult cargo to ship. A vessel leaving Kirkenes with the first shipment in 1910 foundered somewhere near the North Cape, apparently due to the cargo shifting, and causing it to turn turtle.

Additional finances were provided for the Company by Hamburg bankers in 1908 and there has been a close contact with Germany ever since - much of the concentrate being shipped to West German blast furnaces.

The First World War brought financial troubles to the Company due to the Allied blockade of German ports, and the post-war years were also a period of difficulty, but by the late 1930's Sydvaranger had again achieved a strong position, and in 1939, at the end of the first era of Kirkenes mining, an impressible record had been established. A stock-taking at that time would have revealed something like the following:

> About 25 million tons of ore had been mined, and shipped in the form of 11.8 million tons of concentrates. (Averaging 66 to 67 per cent iron, 7 per cent silica, .009 per cent phosphorus) of this total about half (5,800,000) had been exported in the form of briquettes containing about 65 per cent iron and .008 per cent sulphur. The rest had been shipped as powder. The former product had gone mainly to Britain and the latter to western European countries, mainly Germany. The annual rate of production had reached 800,000 tons of concentrate, representing about 1,850,000 tons of ore mined. In all, 215 million kroner had been received for the product. This impressive record was set up in an extremely remote and previously undeveloped locality occupied by a few Lapp and Norwegian fishermen. By 1939, the plant employed about 1,700 workmen, and Kirkenes and Bjørnevatn were well-built and prosperous communities totalling about 7,000 persons.

The Second World War led not only to disruption of mining and ore shipments, it brought about the almost complete destruction of all mining and processing equipment, and even the

town of Kirkenes along with all other settlements in the area. Kirkenes was converted into a Nazi stronghold, heavily manned and armed, a base for naval operations and starting point for air attacks on north Russian convoys. As a consequence, it was very heavily bombed by the Allies, and in the early winter of 1944 what remained was almost completely destroyed by Nazi armies as they retreated westward.

When the war ended, the mining company was confronted with an industry that had in effect been wiped out. If it were to be operated again, it would need complete reconstruction, along with rebuilding of Kirkenes, Bjørnevatn village, railroads, docks and all the other assets built up during the Company's existence. If, on the other hand, the undertaking was of doubtful economic worth under modern conditions, its destruction provided an opportunity to withdraw from the area for good. One asset the Company had of great value was the experience and skill built up by its technical staff in the previous forty years. Sydvaranger possessed the world's best accumulation of knowledge of how to mine and process taconites and to do so in a remote and somewhat unfriendly physical environment. Whether reconstruction would be worthwhile would depend largely on the long-term export market for the product, since Norway at the time had no iron-smelting industry needing it.

Post-War Reconstruction and Expansion

The first consideration in examining the future of Kirkenes mining was to secure a market for the product. Fortunately, this proved simple. Both in Britain and on the continent, customers were ready to purchase the whole output of concentrate. Some required it in powder form while others needed briquettes, as before the war, or the smaller pellets. Thanks to direct ocean transport from concentrator almost to consumer, and the negligible rail transport from mine to shipping point, the Kirkenes product could reach European industrial markets at competitive and even premium prices.

Other factors needing consideration were more problematical. Labour had always been something of a difficulty; in fact output from the plant in pre-war years had been almost in proportion to the labour supply available. There were few reasons why skilled workers should accept jobs "at the far end of the country", at the end of an expensive transportation route and where living conditions might be less attractive than in the south. So any plans for reopening the plant should involve reducing the labour force as low as possible and making living conditions attractive.

Any decision about the plant's future would of course depend on the extent of ore reserves of good quality, their accessibility and the cost of extracting the ore and processing it. While the original equipment installed in 1910 had been ultra-modern, the old designs would need replacement in the light of experience. Finally there was the question of finance. To erect a plant capable of reaching even the pre-war output would require 125 million kroner (about $25,000,000) a very large sum in Norway at a time when other devastated areas farther south needed reconstruction.

This last problem was solved by a happy compromise between private and public financing under which the Norwegian government subscribed about 60 per cent of the necessary capital, while leaving the actual operation of the undertaking to a semi-independent board of directors. In order to secure special equipment from the United States, Marshall Aid of $5,000,000 was provided.

Exploration at the ore field showed ample reserves, and a new plan of operation enabled the Company to continue the use of open-pit methods instead of going underground as had originally been intended. Under this new plan, open working will continue for the next fifteen years, while in the following ten years underground workings will gradually be introduced so that within twenty-five years mining will be completely underground. Some of the reasons behind this change in technique are of interest. The present bottom of the open pit is on an average about 82 metres above sea-level, although at one point it is only 66 metres above sea-level. At the southern end is a lake whose surface is about 81 metres above sea-level. This is to be drained through a tunnel driven in from Langfjord. The tunnel can, after serving as a drain, be used later for mining. The open pit will be carried down to 30 metres below sea-level, at which time underground mining will become necessary. Economic considerations lie behind these

plans. It is estimated that about 45 million tons of ore can be extracted with removal of about 20 million tons of waste rock. Open mining will cease when the ratio between the two becomes 1 : 1 - when a ton of waste must be removed for every ton of ore. Open mining is preferred for many reasons. It requires only two-thirds of the labour force, it permits greater and more flexible use of machinery, and planning and operation of the work is simpler. An apparent objection to it is the winter climate. This has not proved a handicap in the past. In fact, snow and ice provide an excellent surface for the heavy haulage vehicles. The need for working lights in the winter is compensated for by the long working daylight of summer.

One additional factor in favour of open-pit mining has been the development, largely in the United States, of very heavy ore-moving equipment such as shovels and trucks. Shovels now in use can load 4½ cubic yards at a time, into 35-ton carriers. These and other vehicles are able to operate over mine road of about 8 per cent grade, which is far steeper than would be possible with the locomotives employed in the old mine. Hence the open pit can be carried to a far greater depth.

When the decision to proceed with reconstruction was made in 1946, plans were laid out for a completely new mine and processing plant. These new plans called for the use of more mechanical power, a reduction in man-power, and a considerable increase in output.

Certain considerations of a political-economic sort also favoured reopening of the Sydvaranger mine. Finmark, the northernmost county in Norway has long been a "distress area". Seasonal unemployment in fishing and farming has been chronic. Economic distress at a distance from the centre of government in Oslo has tended to breed radical political beliefs based on alleged neglect. The rise in power of the Soviet Union and its nearness to Finmark made this problem even more acute. In modern world strategy the area is clearly not unimportant. The Norwegian Government was for these and other reasons determined to expand the economy of North Norway and give it a broader economic base by encouraging mining and industry and thus providing a market for local products and maintaining steadier employment. While some of the projects forming a part of this North Norway Plan could only mature over a long period of years, Sydvaranger mining could probably revive the derelict local economy relatively quickly. This explains in part the readiness of the Government to provide capital for the Company and a high priority in securing new equipment.

PROCESSING THE ORE

The ore must be blasted out from the pit in terraces, and the larger blocks broken by further blasting. They must then be broken in a crusher to a size suitable for transfer by railroad to Kirkenes. There they need further crushing, grinding and milling to a fine powder, separating the magnetite from waste rock, drying the product, possibly forming it into briquettes or pellets and loading them on the vessel for shipment. At various stages there must be conveyors to transfer material from one point to another, storage bins of various sizes, classifiers to sort the products and so on. The waste rock must also be disposed of.

Experience has shown that very fine grinding is needed to separate the magnetite from the quartz, and this has proved to be very difficult, as has the initial drilling of the ore and breaking it ready for the crusher.

The original plant was elaborate and ingenious, but as a pioneer undertaking, it proved after 30 years to be less efficient than it could be. There were, for example, 32 separate sets of units at the concentrator operating side by side - in effect 32 separate plants, all of small capacity. They needed close supervision by a large staff of workmen and maintenance was expensive. The so-called "briquettes" which formed about half of the end product, were in fact massive conical blocks of concentrate, each weighing 44 pounds (20 kilos). These too needed individual attention. The end product was, however, excellent as less than 3 per cent of the original magnetite found in the ore was lost and the final concentrate consisted of 91.5 per cent magnetite, 6 per cent quartz and 2.5 per cent other materials. To this was added 5 to 7 per cent water when the concentrate was shipped as powder.

Apart from supplies of ore, the plant needed electricity for its many operations, water in large amounts, steel balls and rock pebbles for the mills as well as countless other sup-

plies. In converting 2.3 tons of ore into a ton of concentrate, about 18 kVA of electricity were used. The source of most of this was a steam plant at Kirkenes, using coal imported direct from Svalbard. Furthermore, each ton of ore needed 4½ tons of sea-water while being processed. In addition, fresh-water was needed for steam-making, etc. In this latter matter the plant was well located between the sea on the north and a string of three small lakes on the south.

The New Plant

Changes in mining methods have already been described in outline. There have been corresponding improvements in handling and processing the ore. As it is cheaper to crush large blocks of ore than to drill and blast them into pieces, the world's largest ore-crusher, designed in Norway and built by Nordberg in Milwaukee, Wisconsin, has been installed at the Bjórnevatn mine. Weighing about 500 tons, it is able to take blocks of ore up to 54 inches by 180 inches. To withstand the enormous stresses involved in crushing the very hard ore to a size no larger than 6 inches, the main shaft of the rotary crusher was made 50 inches in diameter. A constant problem with such an enormous crusher is to dispose of the heat generated. About 1,000 gallons of oil circulate in this machine as a cooling agent. Incidentally, the cold winter climate is an advantage in such a case, since the oil cools naturally, but when the crusher is idle in winter some heating is needed.

Another radical revision of the old system was made in the concentrator at Kirkenes, where the battery of 32 sets of crushers, grinders and separators was reduced to four with the possibility of adding others. Interestingly enough, even with the increased use of machinery in mining and processing ore and a greater output, the consumption of electricity has fallen considerably, due to improved design of equipment. The labour force has been drastically reduced.

In outline, the modern processing of the ore is as follows:

> The ore is blasted from the open pit in terraces, loaded by electrically powered tracked shovels into the large trucks already mentioned, and carried to the crusher.

Bulldozers clean up the smaller pieces of ore, and a grader works full time maintaining good road surfaces. At the bottom of the huge crusher, an underground conveyor belt 42 inches wide, runs for about 850 feet at an angle of 15½ degrees raising the ore about 225 feet to the top of a 10,000 ton ore bin excavated in the solid rock. Below this bin are railroad tracks where ore cars are loaded. Trains of about twelve, 40-ton cars, hauled by an electric locomotive carry the ore the 5½ miles to Kirkenes. About 200,000 tons a month year-round are shipped in this way.

Subsequent treatment of the ore is not complex in principle, although difficult to carry out in practice. The ore must be crushed further, and then transferred to ball mills where the ore is rolled around with steel balls of about 5 inches in diameter. The balls are of course gradually worn away, but in the process the ore is ground to powder. The finer particles are separated from the larger by screening, and, now a heavy pulp of ore and water, are passed over a series of magnetic drums which attract the magnetite but allow the waste rock to escape. This waste is carried, still mixed with water, through a tunnel to be dumped in the sea. Powerful vacuum filters then extracted most of the water from the concentrated magnetite, which is finally dried in heated kilns. The magnetite particles at this stage average about one-twentieth of a millimetre in diameter.

In the old plant, part of the final product was as has been shown, made into large briquettes by heat and compression. At present the whole product is sold as powder. However, work has started on a series of furnaces to be used in making pellets - small balls of concentrate about 10 mm. in diameter, which are sintered to give them a hard outer shell. Tests have shown that these are excellent for blast furnace use, since they withstand crushing. Pellet production should commence at Kirkenes in 1955.

At the time of writing, the concentrate ready for export is carried by conveyors to a 50,000-ton storage bin excavated in the cliff near the export quay. It is conveyed, as required,

on other belts at a rate of 1,000 tons an hour to the ship's hold. Vessels drawing up to 30 feet, and up to 15,000 tons can be accommodated. Additional storage space is to be excavated in the cliff so as to quadruple that now available.

Provision of Electric Power

Electric power sufficient to handle the heavy demands of the mine, railroad and concentrator, as well as the lighting and power needs of various communities, has not been so easy to provide. Although Norway rightly has a reputation for being a leader in hydro-electric development, the Kirkenes area is not particularly well endowed. The best hydro-power sites are waterfalls on the Pasvik River, a few miles east of Kirkenes, but as the river is the boundary between Norway and the U.S.S.R. there seems no immediate possibility of it being harnessed.

Beginning in 1920, a small hydro plant was built at Tårnet about 15 miles northeast of Kirkenes where a 30-foot head of water is carried through a wooden stave flume to generate about 1,000 kVA. This old plant is to be completely rebuilt shortly. A decade later, a second hydro plant was built on the sea-coast 25 miles northeast of Kirkenes and only three miles from the international border. There a head of 330 feet is carried through rock-cut tunnels to develop about 2,000 kVA. This latter plant can only be reached from Kirkenes by sea.

Since the Second World War, a third hydro-electric plant has been built at Gandvik about 40 miles northwest of Kirkenes. Of about 5,200 kVA capacity, it is primarily intended to serve various local communities, but it also supplies the mining company at Bjørnevatn with 1,000 kVA. Another publicly owned hydro plant is planned for Neiden 20 miles west of Kirkenes. To be of 7,500 kVA, it should provide some power for use by the mining company.

As has been the case since the mine opened in 1910, the main supply of electricity is generated at a steam plant at Kirkenes itself. The present plant has two generators which together produce about 15,000 kVA. This is a completely modern and highly efficient installation. It has been found that Svalbard coal, despite its 10 per cent ash content serves excellently. Cooling of the condensers is done by pumping sea-water which is always at a low temperature. This water, once heated is then pumped to the concentrator to be used in processing the ore.

In addition to supplying the mining company, the various electric plants also serve to ensure communities in the area against being without power, since all of them are inter-connected. Such insurance is particularly necessary because of the long, dark winters and the isolation of the area from other sources of power.

It should be emphasized that, not only in the supply of power, but in many other ways, this isolated region is compelled to be as self-sufficient as possible. The mining company maintains exceptionally large stores of spare parts, its repair shops are unusually well equipped and its workmen must be highly skilled and adaptable. Electrical equipment, mining machinery, locomotives and so on must be overhauled locally because of the delay and expense involved in shipping them the long distance to South Norway. Even such unusual facilities such as those for the retreading of the huge ore-truck tires, and the manufacture of oxygen for the welding must be maintained. Due to the short shipping season from Svalbard, a stock pile of 25,000 tons of coal must be built up during the summer.

PRODUCTION

Planned capacity of the Sydvaranger plant is about 2.3 million tons of ore per annum, equivalent to one million tons of final product. Following remarkably speedy reconstruction, the first ore was shipped from the mine to Kirkenes in March, 1952, and the first concentrate left the port in mid-May en route to Barrow-in-Furness, England. By the end of 1952, exports totalled 425,856 tons shipped in 58 vessels. In December of that year 90,000 tons were exported, indicating the the plant was approaching its planned capacity. That year's shipments brought to Norway the equivalent of 36 million kroner (about 5.2 million dollars) all in much needed hard currencies, mainly from West Germany and Britain, and a profit on the year's

working of about 1.4 million kroner. At this time the Company employed 1,000 persons of whom 850 were workmen at Kirkenes and Bjórnevatn. Assets of the Company then totalled about 180 million kroner.

This promising beginning was maintained in 1953 - and although final figures are not yet available, the exports for the year should reach an estimated 830,000 tons, going as before to West Germany with lesser amounts to Britain and Belgium. Gross income from these sales should be about 90 million kroner. A single experimental shipment of 7,000 tons of concentrate came to the United States in August in 1952, but its exact destination is not known. Regular shipments to the United States would of course be particularly desirable for Norway, since they would bring in dollars. As it is, exports are directed mainly to countries which provided machinery and equipment during reconstruction. The amount from Germany and Britain was worth about 40 million kroner.

The picture for 1954 appears to be equally promising since all the anticipated export for that year had secured purchasers by June, 1953.

CONCLUSION

The reconstructed Sydvaranger enterprise - which literally arose from the ashes - has already brought new life to a region extending south into the Pasvik Valley and east and west along the southern shore of Varanger Fjord. Before the war Kirkenes itself had a population of about 4,500 with another 1,500 people living at Bjórnevatn, and a total of about 10,000 in the area as a whole, more or less dependent on the mine. By 1944 the economic basis of the region had all but disappeared - and with it many of the people. There was very real hesitation as to whether reconstruction of the plant and rebuilding of these various communities could be economically justified.

Today at the end of 1953, Kirkenes is approaching complete reconstruction and the other settlements are well on the way to being rebuilt. There seems good reason to believe that the industry will prosper and may well expand its capacity. Kirkenes, furthermore, provides an important terminal point on the shipping route linking ports along the coast of Norway with Oslo. It attracts many tourists every year, and is strategically important vis-à-vis the Soviet Union and the Barents Sea. The mining company makes a handsome contribution to the national economy, since it represents at present about one-sixth of the country's mining production, and accounts for perhaps 85 per cent of Norway's iron ore exports.

While there is a natural desire at present to export all the Sydvaranger concentrate so as to secure foreign exchange, the mine can, if necessary, supply ore to the new nationally owned iron and steel plant at Mo i Rana some distance to the south, should the local mines not be ready in time. In this way, otherwise essential imports of foreign ore would be avoided.

SELECTED REFERENCES

A/S Sydvaranger, Årsberetning for 1952, Oslo, February, 1953.

Bóckman, K.C., Bergverksdriften i Nord-Norge, Dens Fremtidsutsikter. Studieselskapet for Nord-Norsk Naeringsliv, Skrift Nr. 5, Bodó, 1949.

Johansen, J. Kraft, "Iron Ore Concentration at Sydvaranger, Norway", Journal of the Iron and Steel Institute, 162, 1949, p. 4, etc.

Johansen, J. Kraft, "Aktieselskabet Sydvaranger", Tidsskrift for Kjemi, Bergvesen og Metallurgi, Nr. 2b, 1950, pp. 1-10.

Lund, Worm, "Agglomeration of Taconite Concentrate", Journal of Iron and Steel Institute, 162, 1949, p. 1.

Norges Offisielle Statistikk, XI, 124, Norges Bergverkdrift, 1951, Oslo, 1953.

Norges Offisielle Statistikk, Månedsoppgaver over Vareomsetningen med Utlandet. Monthly.

Sør-Varanger Avis, Special issue on A/S Sydvaranger, April 9, 1952. Also numerous other issues 1951-53.

Mineral Position of E.C.A. Nations, Engineering and Mining Journal, March, 1949, p. 82.

"The Sydvaranger Story", Mining World, 15, 1953, pp. 49-76.

Interviews and correspondence with A/S Sydvaranger officials at Kirkenes, between 1949 and 1953.

EMIGRATION RURALE A L'ECHELON PAROISSIAL[1]

Louis-Edm. Hamelin

Université Laval

Vers 1815, la pression démographique dans les pays ruraux de la rive Nord du Saint-Laurent poussait les jeunes gens à coloniser les Laurentides. Le mouvement a été lent à cause des obstacles à vaincre. Le rideau forestier, l'absence de routes, les chutes sur les rivières, le nombre restreint des missionnaires-colonisateurs sont au nombre des facteurs qui ont conditionné la marche du peuplement canadien-français au-delà de la Plaine et dont l'analyse n'a pas à être tentée maintenant.

C'est ainsi que dix ans plus tard, aux frontières des régions de Trois-Rivières et de Joliette, un double mouvement de pénétration venant à la fois du S.-E. et du S.-O. amenait des colons dans la haute vallée de la Maskinongé. Marchant l'un vers l'autre, ces deux caravanes humaines ont fini par se rejoindre; en 1852, l'arrivée d'un curé qui vint établir son église à mi-chemin des pôles initiaux consacra l'existence de la nouvelle paroisse de Saint-Didace. Au cours des trente années suivantes, le jeune centre qui n'avait au début qu'une dimension linéaire, parallèle à la rivière, s'agrandit démesurément: plusieurs colons se trouvaient déjà à plus de dix milles du petit village qui n'était d'ailleurs plus central.

DESCRIPTION DES LIEUX

Ils appartiennent à l'un des divers types que l'on rencontre dans les Laurentides. Saint-Didace est situé sur des crans rocheux qui font montagnes et dont l'altitude dépasse 1,100 pieds.[2] Entre ces buttes-témoins du Plateau laurentien, s'étendent d'étroites plaines de 400 à 600 pieds affectant la forme d'un "T" renversé dont la base, orientée d'Est en Ouest, suit la rivière Maskinongé et dont la rive Nord-Sud est drainée par l'affluent de la Maskinongé: la rivière Blanche. Ces régions basses sont planes et constituées d'argile Brandon surmontée d'une mince couche de limon.[3] Quoiqu'aucune preuve irréfutable n'ait été encore découverte, nous croyons que cette argile s'est déposée dans le fond d'un bras étroit de la Mer Champlain. Vers 600 pieds d'altitude et à proximité des "montagnes", les sols deviennent caillouteux, mais la topographie demeure unie et faiblement inclinée. Le long de la rivière Blanche, ces hautes plaines "graveleuses" font place en aval à des sables. Nous sommes en présence d'un delta fini-marin, modèle réduit de celui du Saint-Maurice. Dans ce matériel tendre, l'érosion, excitée par les précipitations et par les vomissements de la nappe phréatique, a vivement travaillé; de larges rainures ainsi que des parois de décollement déchirent les plaines et les ont réduites à l'état de morceaux isolés. Un relief ainsi défoncé crée de gros inconvénients pour la culture mécanisée et les voies de communications.[4] Par ses plaines et son delta, le Bas-St-Didace est un appendice des Basses Terres du Saint-Laurent. Entre les buttes précambriennes et les plaines récentes, les versants ont leur originalité. Le passage de bas en haut n'est jamais brutal bien qu'il soit toujours différent d'un point à l'autre. Normalement, les terrains sont étagés de la façon suivante dans cette région médiane en altitude: en quittant l'argile ou le limon de la Plaine, on touche du pied des cailloutis, puis on traverse une ceinture d'erratiques que ni les eaux courantes ni la Mer n'ont pu digérer; encore plus haut, on trouve la moraine surtout logée dans les niches du versant, enfin la roche en place. Cette zone de transition, très différenciée, mais moins fertile et plus froide que la Plaine a été quand même

---

[1] Cette étude fait partie des recherches que nous avons entreprises en 1953, grâce à un octroi du Conseil canadien de Recherche en Sciences sociales.

[2] Carte préliminaire fédérale, Saint-Gabriel, 1 mille au pouce.

[3] Communication personnelle des classificateurs Gérard Godbout et Auguste Mailloux.

[4] Ces inconvénients ont été traduits dans la toponymie. Les "coulées" sont les profondes échancrures que forment les vallées. Un rang qui traverse perpendiculairement une dizaine de coulées a pris pour nom: "Les Côtes".

colonisée. On y a ouvert des rangs comme dans toutes les zônes de colonisation rurale canadiennes-françaises.[1] Mais cette région ne connaîtra pas le même destin que les Plaines en contre-bas.

La grande étendue de la paroisse en regard de sa faible proportion de terres cultivables (30 pour cent) assurait aux habitants de vastes réserves en bois, non inépuisables toutefois; aujourd'hui, les feuillus l'emportent sur les conifères disparus rapidement lors de la première génération. Partout, même sur les buttes, le paysage forestier est très aéré.

Saint-Didace se partage donc en trois régions: de petites plaines constituées d'éléments fins; des bas de versants caillouteux; des buttes rocheuses. La valeur agricole du territoire est inversement proportionnelle à l'altitude. Doté d'une telle nature, le petit centre qui allait s'engager dans une vocation agricole pouvait-il espérer connaître un avenir illimité?

EVOLUTION DEMOGRAPHIQUE

Après 1820, date approximative de l'arrivée des premiers colons, la population s'accroît d'abord lentement; aussi, en 1851, n'atteignait-elle pas encore 700 habitants.[2] Mais durant les trente années suivantes, la population va augmenter à un rythme exceptionnel. En 10 ans seulement, de 1850 à 1860, elle saute de 689 à 1,654. Cette augmentation de 1,000 en 10 ans restera le mouvement le plus massif dans toute l'histoire de la paroisse. Après 1860, le chiffre continue de s'accroître; en 1870, il dépasse 2,000. Les progrès continuent jusqu'en

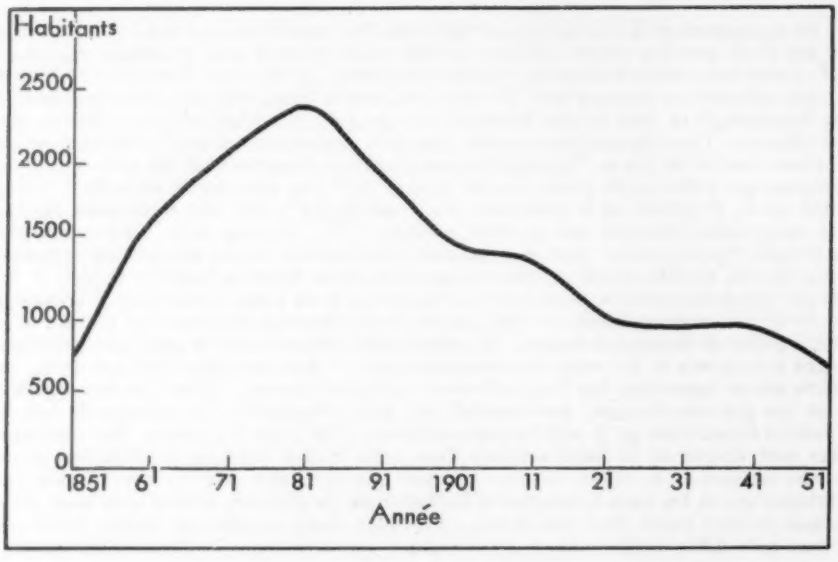

Figure 1. Evolution de la population, Saint-Didace, 1851-1951.[3]

---

[1] Deffontaines, Pierre: Le Rang, type de Peuplement rural du Canada français. Les Cahiers de Géographie, 5, 1953.

[2] Audet, Francis-J.: Le Comté de Maskinongé, 1853-1867. Trois-Rivières, 1934.

[3] Recensements du Canada, Ottawa, Bureau Fédéral de la Statistique.

1880, et la population grimpe à 2,500. Saint-Didace est alors à son apogée: il est le centre le plus populeux du Comté de Maskinongé dépassant même le chiffre de population des vieilles paroisses "des bas"; jamais dans son histoire, Saint-Didace ne fera vivre un aussi grand nombre d'habitants. Depuis cette grande époque, la population ne fait que diminuer. En 1900, elle était déjà descendue à 1,500; en 1921 à 1,000; au début de 1954, la paroisse ne compte pas 700 habitants.

Le chiffre total de la population didacienne a donc varié considérablement au cours de son histoire. L'évolution s'est faite en deux périodes: un accroissement lent puis rapide à partir de 1820; une diminution brusque et continue de 1880 à nos jours. La population est aujourd'hui la même qu'elle était à l'arrivée du premier curé il y a un siècle. Cela ne manque pas d'être anormal et tragique. Où réside la raison de ce piétinement démographique? Est-ce dans un déficit des décès sur les naissances? ou dans des partages paroissiaux? ou bien dans des mouvements migratoires?

ETAT CIVIL

La décroissance d'une population ou sa stagnation peut s'expliquer si le nombre annuel des décès excède celui des naissances ou bien s'il lui est égal. A Saint-Didace, aucun de ces deux phénomènes ne s'est déjà produit. Tous les ans, les nouveaux-nés ont été plus nombreux que les personnes décédées;[1] durant l'année où cet excédent a été le plus faible, 1935, les naissances l'ont encore emporté de trois unités. C'est que les baptêmes ont toujours été très nombreux. En cent ans, les prêtres ont inscrit 7,038 baptêmes sur les régistres de la paroisse:[2] même, durant les belles années de 1861-1888, il s'en célébrait plus de 100 par année. Ainsi, le taux de natalité a toujours été fort; il est monté jusqu'à 63.4 pour 1,000, il y a 100 ans; le taux séculaire moyen se chiffre à 47.4; pour la dernière période décadaire, il dépasse 31; même en périodes de forte émigration durant lesquelles avait relativement diminué le nombre des parents en état de procréer, le taux calculé sur l'ensemble de la population n'est pas descendu en dessous de 25 pour 1,000. Nous sommes donc en présence d'une population prolifique.

Par contre les décès ont été rarement plus nombreux que 50 par année, et nous n'en avons relevé que 3,160 dans les régistres paroissiaux. Le taux élevé du siècle dernier est descendu à 11 pour 1,000 aujourd'hui. Dans ces conditions, les décès ont été bien moins nombreux que les naissances; en soustrayant les deux nombres, nous trouvons un excédent de 3,878 personnes. En d'autres termes, près de 4,000 habitants ont été baptisés à Saint-Didace mais n'y ont pas été enterrés. Comme la population actuelle équivaut à celle de la période de fondation, nous n'avons pas à établir une correction pour les habitants de 1852 qui sont nés ailleurs et ont été ensevelis pour la plupart à Saint-Didace; leur nombre est annulé par les résidents actuels qui ont été baptisés à Saint-Didace mais qui ne sont pas encore morts et enterrés.

L'examen des mouvements biologiques de la population didacienne bien loin de nous expliquer la décroissance démographique de la paroisse nous fait part d'un excédent naturel prodigieux. Le vrai problème est donc celui d'une hémorragie.

L'EMIGRATION

L'évolution de la population ne semble pas pouvoir s'expliquer sans faire appel à l'émigration. La population de la paroisse a diminué parce que beaucoup d'habitants ont quitté leurs terres. Il n'est pas facile de connaître le nombre exact des émigrants. Il nous est toutefois possible, par l'intermédiaire de la fiche démographique classique, de calculer de combien le nombre de citoyens qui sortent dépasse celui de ceux qui entrent. Nous en avons compté 4,231

---

[1] Régistres de la paroisse, volumes A, B, C, D, E, F, G, H, I.

[2] La paroisse étant totalement catholique, le nombre des naissances équivaut à celui des baptêmes. Les baptêmes qui se font à l'hôpital sont rapportés dans les régistres paroissiaux. Le curé est l'officier de l'état civil.

de 1861 à 1951. Durant 90 ans, Saint-Didace a perdu au moins 4,000 âmes. Ce chiffre global, presqu'incroyable, provient de l'accumulation du nombre des émigrants depuis près d'un siècle. Le mouvement a été continu mais l'intensité a varié avec les époques. Le tableau suivant indique à quelles périodes les départs ont été les plus nombreux. Trois groupes d'années prédominent:

TABLEAU 1.

Mouvement Décennal de la Population, Saint-Didace, 1861-1951.[1]

Périodes	Excédents des Sorties sur les Entrées	Taux Décennal de Déficit
1861-1871	252	13.5
1871-1881	286	12.7
1881-1891	886	40.7
1891-1901	922	53.3
1901-1911	432	29.1
1911-1921	689	55.4
1921-1931	198	18.8
1931-1941	64	5.9
1941-1951	502	52.4
TOTAL	4,231	100.0%

A la fin du XIXe siècle, entre 1881-1901, les émigrants n'ont jamais été plus nombreux; durant ces vingt années, 1,800 personnes ont quitté la paroisse. C'est à cette époque que Saint-Didace a perdu la place honorable qu'il occupait dans le Comté sur le plan population. Cette emigration massive s'explique par le fait que plusieurs causes ont joué en même temps: la fin de l'ère prospère du bois à Saint-Didace, la possibilité de trouver du travail dans les "factories" étatsuniennes, la redistribution territoriale désastreuse pour la paroisse que nous étudions, la colonisation de l'Ouest, du Témiscamingue et du Lac Saint-Jean. Une deuxième période d'émigration massive est celle qui a accompagné la Première Grande Guerre: durant la décade correspondante, la paroisse a perdu près de 700 habitants. Enfin, la troisième série des départs est contemporaine d'événements, conséquences de la guerre de 1939; à ce moment, 500 personnes ont laissé la paroisse. L'examen du taux du déficit nous indique que durant ces trois époques, Saint-Didace a perdu chaque fois un nombre d'individus équivalant à plus de la moitié de la population du début de ces périodes.

Le tableau 1 nous révèle aussi que l'émigration est un mouvement continu, un mal qui ne s'est arrêté durant aucune décade même pendant celle de 1931-1941; c'est en somme, une plaie permanente qui a été simplement plus vive lors des vagues d'industrialisation de la Nouvelle-Angleterre et de la Province.

Catégories d'Emigrants

Après avoir considéré les grandes périodes durant lesquelles les Didaciens ont quitté leur paroisse, voyons quels sont les gens qui sont partis. Une catégorie spéciale d'habitants qui ne fait plus partie de Saint-Didace est constituée de personnes de tous âges qui ont été versées dans des centres voisins lors des partages territoriaux. Saint-Didace a été en partie la paroisse-mère de Saint-Charles et de Saint-Edouard. A ces occasions, elle a payé en territoire et en hommes; elle tient de ces déchirements l'aspect déchiqueté de ses frontières; nous avons pu établir qu'elle a perdu au-delà de 200 personnes vers 1915 lors de la fondation

[1] Manipulations à partir des données de l'état civil et celles des recensements.

de la Mission de Saint-Edouard.[1] Les pertes avaient été plus sérieuses quand fut incorporé Saint-Charles; des témoins nous ont parlé du chiffre de 500. Ces départs involontaires ne sont pas à proprement parlé de l'émigration rurale, mais ils ont quand même contribué à diminuer la population de Saint-Didace. Ainsi 700 personnes sont sorties de cette paroisse par suite de décisions administratives, soit le sixième seulement des 4,231 personnes qui représentent, nous le répétons, l'excédent des départs sur les arrivées.

Une deuxième catégorie d'émigrants - des vrais ceux-là - sont constitués des gens de tous âges qui habitaient dans des rangs aujourd'hui abandonnés. L'étendue actuelle de la paroisse est loin de correspondre à celle de 1880, même si l'on tient compte des nouvelles divisions administratives. Depuis la fin du XIXe siècle "plusieurs rangs ou sections de rangs ont été désertés, tels le rang Saint-Guillaume, la concession Sainte-Lucie, la concession Charlotte, le cinquième rang de Lanaudière et le Petit rang. Quant aux rangs Forsight, de la Rivière et du Lac Rouge, des Deux-Rivières, de la Rivière Blanche, ils seront bientôt fermés. Saint-Didace subit donc depuis plus de cinquante ans un repli territorial continu".[2] Les terres que

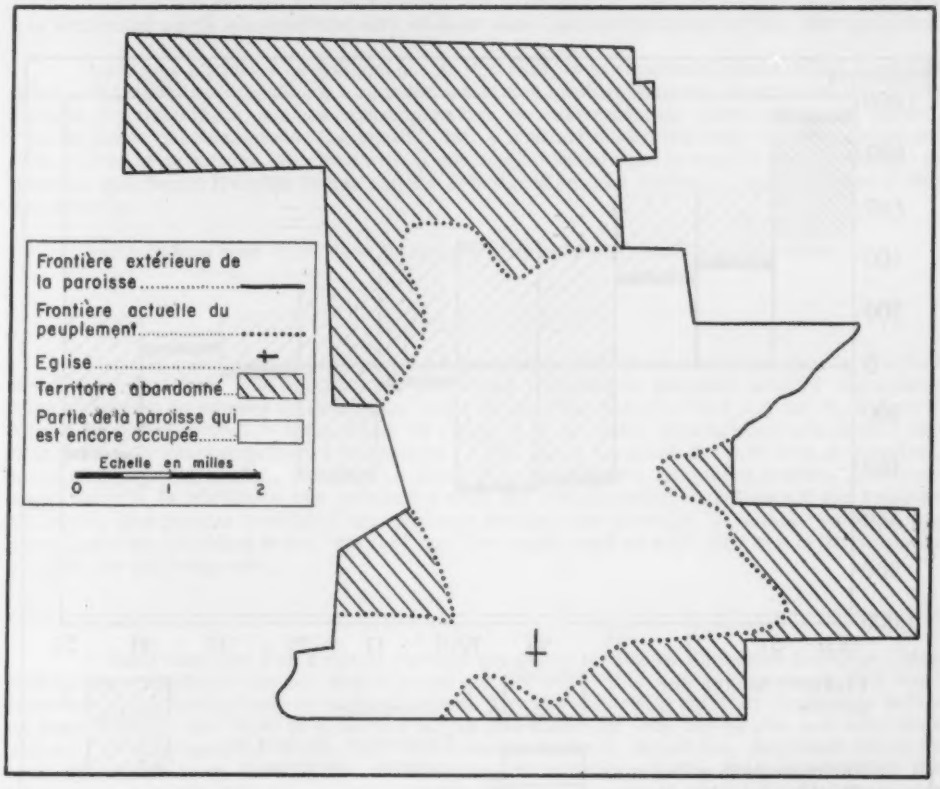

Figure 2. Repli territorial, Saint-Didace, 1954. Vers 1880, la frontière du peuplement se confondait avec celle de la paroisse. Le territoire s'est donc grandement rapetissé.

---

[1] Etude comparée des régistres et du cadastre de cette paroisse.

[2] Hamelin, Louis-Edm.: Le Rang à Saint-Didace de Maskinongé, Notes de Géographie, 3, 1953.

l'on a abandonnées font partie de cette région de transition dont nous avons parlé dans la description du pays. Le sol est morainique et l'altitude à laquelle il est perché a rendu impossible toute submersion, du moins une submersion prolongée, de la part de la Mer Champlain. Les rendements sont donc faibles. Les "solages" ainsi que les clôtures en pierre sont les vestiges qui nous ont permis de reconstituer l'ancienne géographie agraire. Nous estimons ainsi à 500 personnes le capital démographique perdu lors de ce repli territorial. Ce recul humain est conforme à une politique agricole rationnelle. On a quitté les terres et les rangs qui n'auraient jamais dû être colonisés. L'émigration correspond ici, après une ou deux générations d'occupation, à un abandon de l'occupation plutôt qu'à un amincisement démographique.

Une troisième classe d'émigrants groupe la majorité de ceux qui sont partis, nous voulons parler particulièrement des jeunes qui quittent annuellement la paroisse presque depuis sa fondation. Nous avons vu que l'excédent des naissances sur les décès est élevé; il a été de 3,878 de 1851-1953; il s'est chiffré à 83 pour la seule année 1883; en 1952, bien que la population de la paroisse ne fût que de 757 âmes l'excédent s'élevait à treize. Dans ces conditions, l'on peut entrevoir que le nombre de jeunes en quête de travail chaque année est élevé.

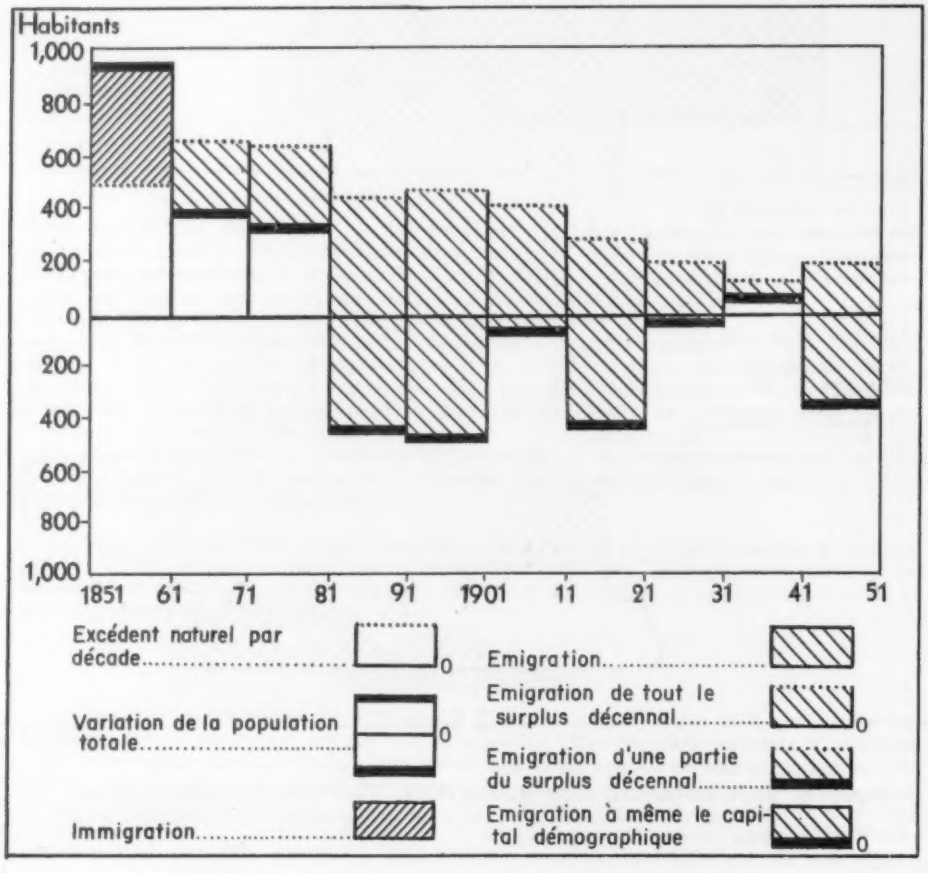

Figure 3. Mouvements migratoires décennaux, Saint-Didace, 1851-1951.

Or, à Saint-Didace, les revenus n'augmentent guère d'année en année. L'économie rurale domine: 66 pour cent des familles vivent sur des fermes. Mais l'économie agraire canadienne-française est extensive: elle fait vivre peu de gens à l'unité d'espace; à Saint-Didace, 25 habitants au mille carré; dans les bonnes paroisses de la Plaine, la densité agricole ne dépasse pas 60. De plus, c'est une densité qui ne s'épaissit pas avec les années. Une fois que le rang est occupé, il a un état quasi définitif. Dans ces conditions, comme la population est prolifique, l'émigration est un corollaire nécessaire de notre type de peuplement. Une espèce de mécanisme traditionnel repousse les jeunes à l'extérieur du cadre où ils sont pourtant nés. Notre système agraire a beaucoup d'éléments pour être expansionniste. Mais faute de bons sols, l'espace agricole didacien n'a pu s'agrandir au point d'absorber l'excédent naturel de la population; il ne se fait plus de terre neuve; les jeunes n'ont pas de chance de s'installer sur une terre s'ils ne sont pas les légataires du bien paternel d'ailleurs indivis.[1] Ces privilégiés sont évidemment le petit nombre. En dehors de l'agriculture, les possibilités de gagner sa vie à Saint-Didace sont également très réduites.[2] Alors, la forte émigration des jeunes est inévitable.

Ainsi l'analyse des diverses catégories d'émigrants nous révèle que Saint-Didace n'a pas seulement perdu son excédent naturel mais aussi une partie de son capital démographique.

Le figure 3 illustre ce phénomène. Si l'on excepte la décade de consolidation du peuplement, 1851-1861, aucune décade n'a gardé intact son excédent naturel; presque toutes, si l'on excepte les premières, encore contemporaines du mouvement de colonisation, ont perdu la totalité de cet accroissement. Le capital, lui, a souffert durant les vingt dernières années du XIXe siècle et durant les deux guerres; il est logique de voir que le capital démographique n'a diminué que durant les plus fortes vagues d'émigration. Le capital a fourni environ un tiers des départs.

Saint-Didace nous offre donc l'exemple d'un gros cas d'émigration rurale.

Lieu d'Emigration

Une des questions les plus passionnantes réside dans la recherche du lieu de résidence des émigrants. Pour quel paradis, ont-ils troqué leur pauvre paroisse natale? Directement nous avons peu de moyens de le savoir. Nous ne pouvons pas employer comme en France les cartes de rationnement.[3] Nous avons dû recourir à de petits stratagèmes indicateurs de la destination qu'avaient prise les émigrants. Nous avons consulté des histoires de paroisses, mené des enquêtes orales, examiné en détail l'émigration des dernières années; nous avons aussi cherché la résidence des personnes avec qui les didaciens entretiennent des relations, au moyen des carnets mondains des journaux locaux, par exemple: le simple examen de la provenance des parrains et des "visites" que l'on reçoit nous en a dit long sur la direction empruntée par les émigrants.

---

[1] Voici comment l'on a décrit l'avenir que guette les jeunes Canadiens français: "Many writers have alluded to the fact that if farms are not to be divided, then there must be a single inheritor of the family lands in each generation. The non-inheriting children can remain in farm as dependents or can leave to found new farms elsewhere, or they can go into non-farm occupations. If they leave the family farm and become farmers elsewhere, they must either buy land, in general from the English, or settle new territories. If they leave agriculture they may become priest or storekeepers, or go into city factory work." Nathan Keyfitz, Populations Problems, dans Essais sur le Québec contemporain, Québec, 1953, p. 67-96.

[2] Quarante pour cent de la main d'oeuvre didacienne travaille en dehors de la paroisse. Cette migration quotidienne ou saisonnière est peut-être le prélude d'une émigration définitive.

[3] Beaucoup d'auteurs se sont servis de cet instrument. Citons entre autres Derruau, Max: Un "village-tombeau" dans le Bas-Languedoc, La Revue de Géographie Alpine, XLI, 1953, pp. 99-115.

Les Etats-Unis ont été, après 1880, le lieu de destination préféré des émigrants; ils ont attiré les Didaciens jusqu'en 1925. La paroisse en fut complètement bouleversée. Un missionnaire-recruteur facilitait l'exode des gens qui allaient constituer là-bas de petites colonies. De 1,000 à 1,500 personnes ont quitté leur paroisse natale pour les centres de la Nouvelle-Angleterre. Ces émigrants n'ont pas tous été perdus définitivement pour Saint-Didace. Plusieurs partaient dans l'espoir très franc de revenir. Une centaine, peut-être, ont tenu leur promesse; ils ont réintégré leur paroisse d'origine après avoir gagné dans les usines de quoi payer leurs terres et leur roulant. C'est ainsi que plus de la moitié des habitants âgés ont passé une partie de leur vie à l'étranger. Aujourd'hui les ponts ne sont pas encore rompus entre Saint-Didace et les Etats-Unis mais les relations se limitent à quelques visites de parents et parfois à un mariage.

Beaucoup moins important et orienté vers un genre de vie bien différent est le groupe de familles qui ont quitté Saint-Didace pour les régions de colonisation du Témiscamingue, de l'ouest canadien, du Lac Saint-Jean et de l'Abitibi. Comme le mouvement précédent, il fut à son apogée à la fin du siècle dernier, mais il n'est tari que depuis une quinzaine d'années. Cette migration orientée vers l'agriculture n'a guère absorbé plus d'un dixième des personnes qui ont quitté la paroisse. C'est donc par une rupture professionnelle que la plupart des 3,500 émigrants se sont séparés du tronc agricole originel. Pour la majorité des émigrants une question d'adaptation s'est donc posée. Comme tous les autres ruraux qui se sont retrouvés en ville, ils ont dû improviser leur nouveau genre de vie.

La troisième destination des émigrants rappelle la première en ce qu'elle a d'industriel et d'urbain. Depuis 1861, début de l'émigration, un flot variable de Didaciens se sont orientés vers les villes des environs. C'est durant les guerres que ce mouvement fut le plus intense. Un relevé minutieux nous a permis de saisir que Saint-Didace ne perd pas la majorité de ses gens au bénéfice de la Mauricie industrielle comme le fait l'ensemble du Comté de Maskinongé. Au contraire, il les voit partir pour les centres du S.-O.: Montréal pour la moitié des cas; puis, loin en arrière, Saint-Gabriel de Brandon et Joliette. Ainsi malgré les vieux liens du sang, malgré les raisons administratives (diocèse, politique provinciale, conseil de Comté ...) qui la relie à l'Est, Saint-Didace regarde vers l'Ouest. Il faudrait qu'un jour les frontières artificielles s'établissent d'après les données de la géographie. On retrouverait dans ces trois lieux, dans les villes de la Mauricie et dans celles de la rive sud du Saint-Laurent la moitié de tous les émigrants de Saint-Didace.

QUELQUES CONSEQUENCES DE L'EMIGRATION

Elle a contenu la développement démographique de Saint-Didace. Plutôt d'avoir 693 habitants, la paroisse en aurait maintenant 11,000. L'émigration n'a pas fait qu'affecter cette population sur le plan de la quantité mais elle a aussi déséquilibré sa structure interne. La pyramide des âges montre une figure relativement épaisse à la base ainsi qu'au sommet mais amincie au centre. Les adultes sont peu nombreux par rapport aux enfants et aux vieillards. Voilà une cicatrice biologique du dépeuplement.[1]

Sur le plan de l'oekoumène, l'émigration a fait replier la paroisse sur elle-même: 40 pour cent de la longueur originelle de tous les rangs est fermée ou en danger de l'être. Ce rapetissement du territoire qui s'est soldé par l'abandon d'une centaine de fermes n'a pas en soi commandé une variation dans la densité de la population restante. C'est plutôt par l'amincissement des familles, par l'éclaircissement des fermes à l'intérieur d'un même rang, par un timide essai de regroupement des terres que la densité de la partie de la paroisse qui fut toujours habitée a pu légèrement diminuer.

---

[1] La statigraphie de la population en 1953 est le reflet des mouvements migratoires qui ont sans cesse affecté les classes d'âge. Quarante-sept pour cent des personnes ont moins de 20 ans; 40 pour cent seulement de 20 à 60 ans; 13 pour cent de plus de 60 ans. Une autre façon de constater l'étiage des classes adultes, c'est de remarquer que de 45 à 75 ans l'arête de la pyramide est verticale. L'émigration a déséquilibré l'emboîtement régulier des classes d'âge entre elles.

L'émigration a fait de notre population, une population très mobile qui contraste avec le concept de fixité qui caractériserait l'habitant canadien-français. La plupart des hommes mariés sont allés dans leur vie travailler à Montréal, aux Etats-Unis, au Lac Supérieur ou ailleurs. Il est rare de rencontrer une famille qui n'a pas au moins un enfant qui travaille à l'extérieur. A Saint-Didace, l'on est donc loin du vase clos qu'on pourrait supposer à priori.

L'émigration à Saint-Didace est donc un phénomène massif. Il y a plus de gens qui ont quitté la paroisse, vivants que morts. Sur deux personnes nées, plus d'une est partie d'elle-même ou avec ses parents. Cette migration s'explique par une vitalité très forte de la population; les excédents ne pouvaient être absorbés sur place étant donnés les systèmes agraire et juridique ainsi que les revenus limités de l'économie didacienne. Saint-Didace peut servir d'exemple de l'émigration très forte dont ont souffert les Laurentides[1] car, ici, ni l'industrie, ni l'exploitation permanente de la forêt, ni le tourisme ne sont venus retenir les habitants. Cette émigration n'est d'ailleurs pas terminée car, d'un côté, quelques terres à rendement marginal sont encore occupées et de l'autre, rien ne laisse prévoir pour un avenir immédiat la naissance d'industries locales qui pourraient employer sur place la classe adulte non-agricole sans cesse assoiffée de travail.

---

[1] Pour une étude d'ensemble de l'émigration des Laurentides, voir Blanchard, Raoul: Le Centre du Canada français, Montréal, 1948, pp. 456-459.

AGRICULTURAL PATTERNS IN THE PRECAMBRIAN AREA OF SOUTHERN ONTARIO

J.H.B. Richards

University of Toronto

The area with which the following discussion is concerned might well be called the "Pioneer Fringe of Old Ontario". It covers that part of the Canadian Shield lying between the "empty" lands north of Lake Nipissing and the heavily populated lowlands of southern Ontario. Its pioneering, of course, is that of the latter half of the nineteenth century, the persistence of which in the latter half of the twentieth century is a matter which requires some explanation.

This Precambrian fringe forms a buffer region between the densely populated south and the wilderness of the northern Shield. It is a transitional zone between agricultural Ontario and the Precambrian area of mining and lumbering. It shares the characteristics of both but belongs fully to neither.

The physical background of the fringe is such that no single resource or, for that matter, combination of resources, provides the possibility of supporting a large population well distributed over the region. In only two aspects, at the present time, does the fringe section compare favourably with southern Ontario. These, tourism and lumbering, are, in a sense, a tacit admission of its marginal, or submarginal, nature. Neither of the other main industries, mining and agriculture, is of high status.

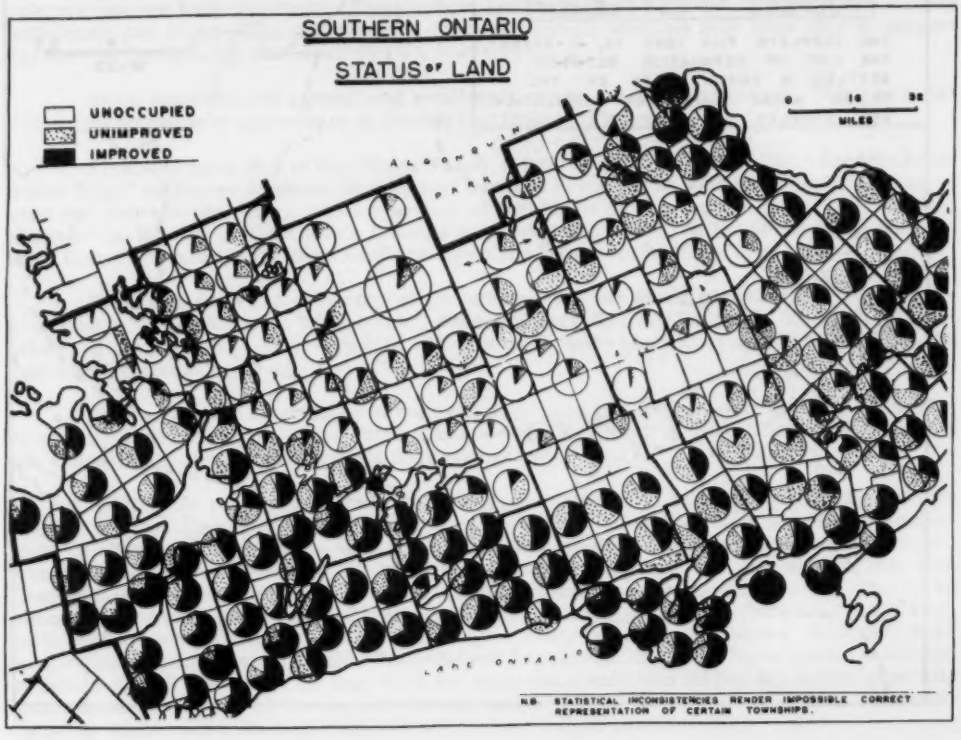

Figure 1.

Despite generally unfavourable conditions for agriculture, farming is still an important vocation over this Precambrian area. Haliburton, in 1951, had rather more than one-quarter of its population (7,670)[1] classed as farm population. Muskoka, another county wholly on the Shield, is not quite so dependent on agriculture; here, tourism and transportation have helped the growth of urban population so that, of the total (24,713), one-third is classed as urban and less than one-eighth as farm dwellers.[2] Over the fringe as a whole the typical Shield township has between 30 and 70 per cent of its people living on farms.

Areally, agriculture is less significant (Figure 1). Muskoka has about one-eighth of its land area in farms and Haliburton less than one-tenth; in each case, less than 25 per cent of this is classed as improved land.

It is true that, from the viewpoint of agriculture, the area is uninviting. However, there are included a number of sections that differ markedly from the Precambrian area generally in that they contain agriculturally productive land and, occasionally, possess other advantages. Agriculture and population have concentrated in such sections. These areas, together with that portion of the fringe in close proximity to the agricultural south, have reacted to pressures and patterns of the south; the latter have been carried into poorer sections of the Shield, too, where they have been further modified by limitations imposed by the physical endowment.

The extension of agriculture into the region occurred, almost wholly, during the latter half of the nineteenth century. The pattern of distribution, established mainly between 1850

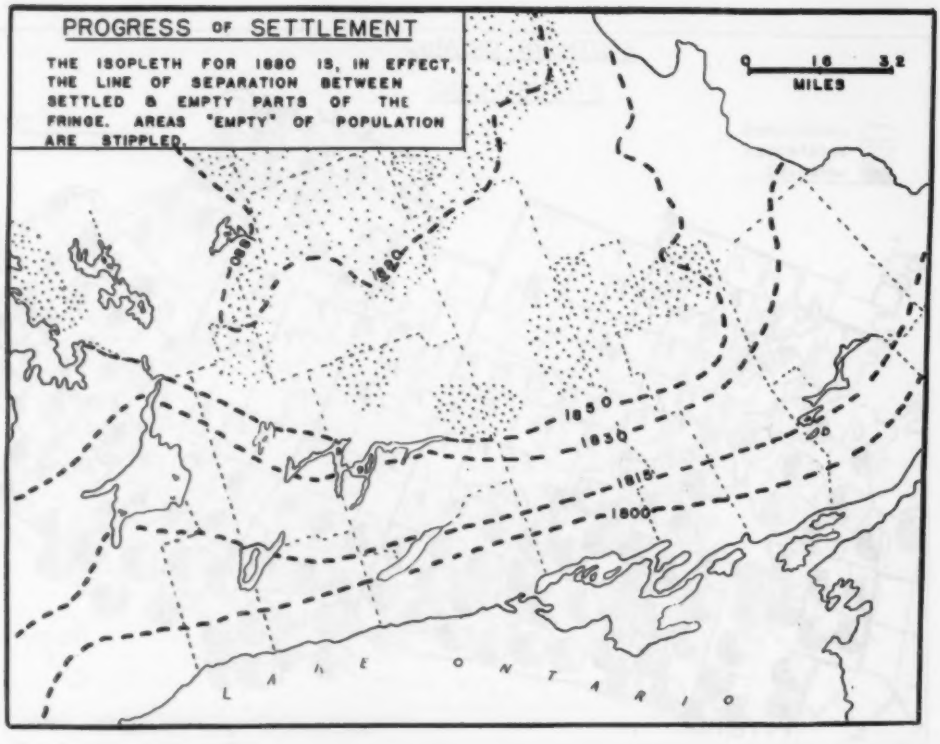

Figure 2.

[1] 1951 Census of Canada. This proportion compares with one-third living on farms in 1941.

[2] 1951 Census of Canada. In 1941 22 per cent of the population lived on farms.

and 1880 and remaining broadly similar to the present day, was the result of a number of factors - physical, administrative, and economic.

Separation in time of settlement in different sections of the Precambrian fringe can be recognized. (Figure 2) In the Frontenac Axis settlement had early spilled across the Precambrian neck both from the west and from the Rideau settlements so that by 1850 the area between Kingston and Brockville could be described as having old clearings.

By 1830 lumbering operations along the Ottawa had induced farming to extend into the Renfrew Lowlands and in 1850 a number of townships each had a population numbered in the hundreds. Settlement followed the major tributaries into the Ottawa-Huron tract and was quickly assisted by wagon roads and colonization roads (the Opeongo and others). But, even in the hey-day of lumbering operations, settlement outside the lowlands was sporadic.

In the central part of the fringe (Trent and Moira watersheds) lumbering and farming started later. They grew with the construction of the colonization roads (Hastings and others) in the fifties and sixties and were aided by the extension of railroads to and onto the Shield.

Farm settlement in the western, Muskoka-Georgian Bay area began in the late fifties but the significant increases in population came after the early sixties. The important aids to settlement included lumbering, the Free Grants and Homesteads Act, the Muskoka Road and the extension of the northern railroad to Gravenhurst in 1875.

By 1880 all the areas presently "occupied" had been taken. From 1880 to the present various changes have occurred. The markets and work provided by lumbering were largely withdrawn and large-scale abandonment followed; certain sections only were able to support farmers in fairly large numbers.

Areal separation of agricultural settlement can be readily appreciated. There is a decided concentration of agriculture in certain localities. (Figure 1)

From Georgian Bay to the Ottawa Valley a narrow east-west zone (the "Border-Transition Zone" of Figure 5) shows transitional features in density of settlement and in forms of land use between the empty interior portion of the fringe on the one hand and "Agricultural Ontario" on the other. Within this transitional zone a number of better areas - the Matchedash Clay Flats and the Hastings Outliers especially - are outstanding.

From this zone are a number of projections into the Shield province - "the Muskoka Corridor", "the Haliburton Re-entrant", "the Hastings-Renfrew Bridge", the Renfrew Lowlands and the Frontenac Axis - each of which is much more significant agriculturally than the surrounding areas.

The two factors outstanding in their influence upon the disposition of agricultural settlement described above are (a) the pattern imposed by the "net" of colonization roads built in the sixties of the last century and (b) the physiography.

Briefly, the colonization roads (Figure 3) were intended to assist in introducing settlers into the Precambrian area. They were designed as a net of service roads connecting the sections in which settlers were to be placed. A great east-west road (the Ottawa and Opeongo) was projected from the Ottawa River to Great Opeongo Lake and was intended to link with Georgian Bay. This road, built to bring settlement into the Ottawa-Huron tract, was to be joined with the old settled areas of southern Ontario by a series of north-south roads including, from east to west respectively, the Frontenac and Madawaska, the Addington, Hastings, Bobcaygeon and Muskoka roads. Other roads helped "complete" the net. These roads succeeded in their designed purpose. That they were not more successful was mainly due to the generally unfavourable attributes of the region. In any case, the general settlement pattern was established by these roads; the truck and automobile have helped preserve it.

Yet, despite the colonization roads - and numerous other aids to settlement - the fringe remains largely empty. The distribution of such concentrations of agriculture as do exist, even though they often conform to the colonization road pattern, is best understood in the light of physiographic analysis.

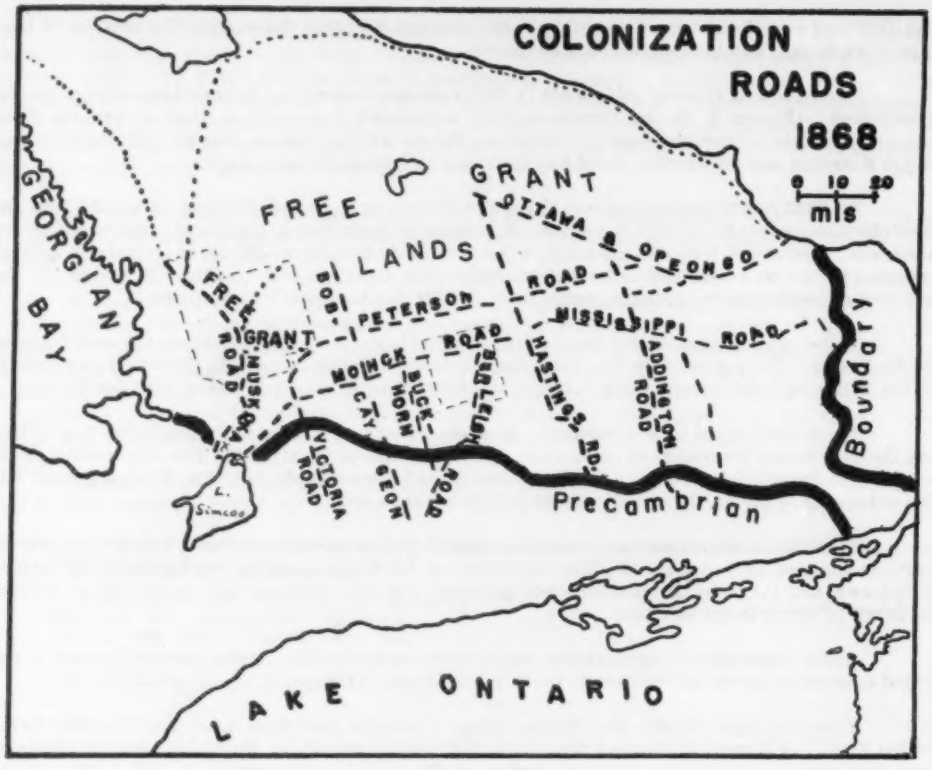

Figure 3.

It is obvious that in such a region a multiplicity of minor physiographic units might be described. In the accompanying map (Figure 4) an attempt has been made to reduce these to a few major "land types". With obvious oversimplification, for the purpose of this discussion these may be divided further into three main physiographic types:

(a) An extensive area of rocky sandy uplands occupies the central part of the region. Flanking this are two areas of similar nature; one occurs on the west and the other extends over much of the southeast. These uplands, the Rock Knob Upland Complex, cover most of the area, are of generally higher elevation, are covered by thin deposits of sandy ground moraine or show large sections almost free of overburden.

(b) Within the Upland Complex, as in the Hastings-Renfrew Bridge and especially along the periphery of the Shield (Border Transition Zone), are localities in which deeper and sometimes less acid drift are common. Here, in the Rocky Ridge and Pocket Land Type, pockets of deeper sands and silts occur between the Precambrian outcrops and domination of landscape by bedrock is not so complete as in the Rock Knob Upland Complex.

(c) The third major land type, the Lake Plain and Minor Ridge Land Type, is recognized in areas where, to a large extent, deposits of glacio-lacustrine or glacio-marine origin obscure the effects of bedrock upon topography and only infrequently are the sand, silts or clays interrupted by rock outcrop. This type is most extensive in the Renfrew Lowlands and in the Frontenac Axis (deposits of the Champlain Sea) but occurs also in the Haliburton Re-entrant (local, "Minden", ponding) and is associated with deposits of glacial Lake Algonquin in the Muskoka Corridor and Matchedash Clay Flats.

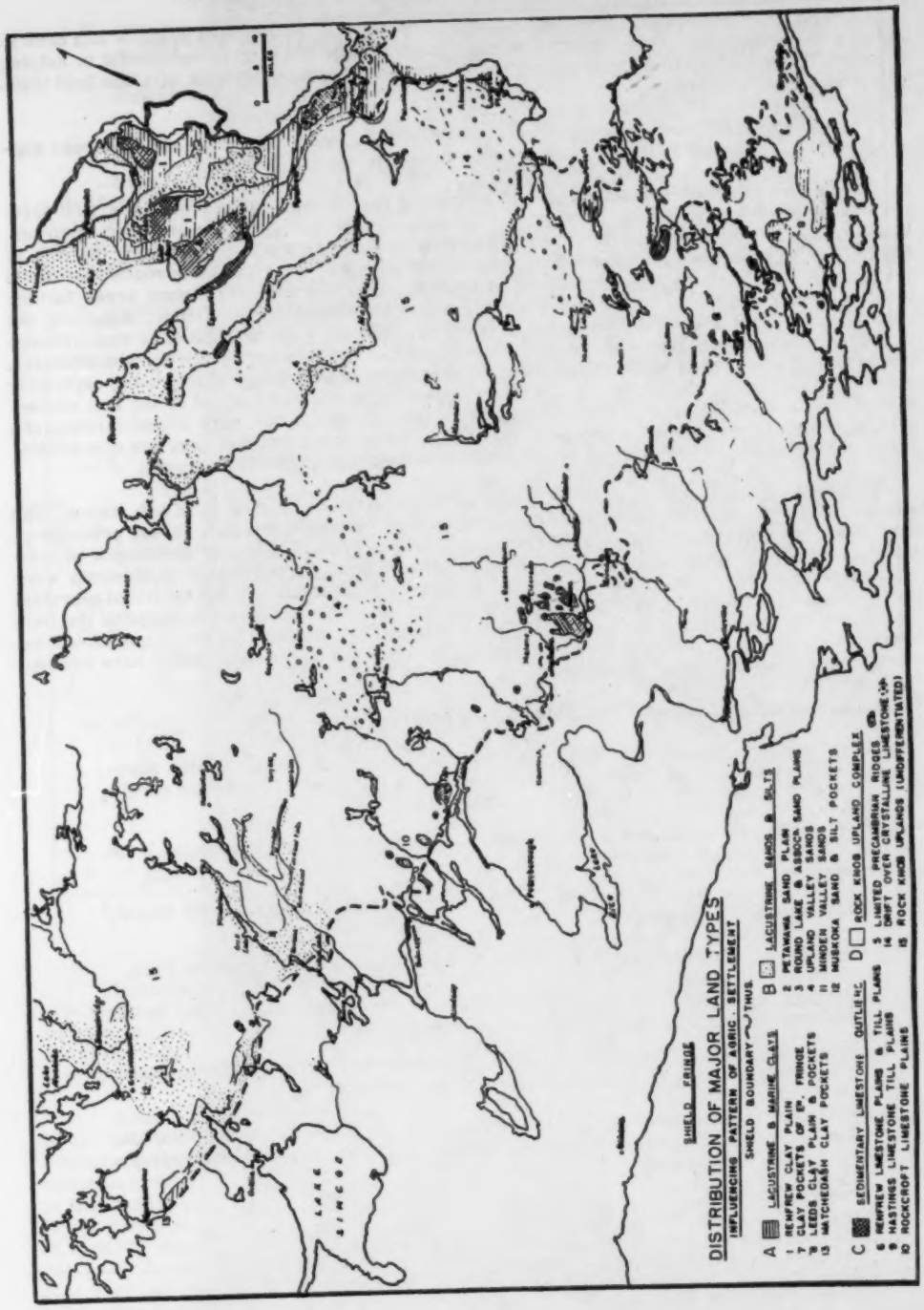
DISTRIBUTION OF MAJOR LAND TYPES
INFLUENCING PATTERN OF AGRIC. SETTLEMENT
SHIELD BOUNDARY
SHIELD FRINGE
A LACUSTRINE & MARINE CLAYS
1 RENFREW CLAY PLAIN
7 CLAY POCKETS OF Fr. FRINGE
7a LEEDS CLAY PLAIN & POCKETS
13 HATCHEDASH CLAY POCKETS
B LACUSTRINE SANDS & SILTS
2 PETAWAWA SAND PLAIN
3 ROUND LAKE & ASSOCA SAND PLAINS
4 UPLAND VALLEY SANDS
11 MINDEN VALLEY SANDS
12 MUSKOKA SAND & SILT POCKETS
C SEDIMENTARY LIMESTONE OUTLIERS
6 RENFREW LIMESTONE PLAINS & TILL PLAINS
9 HASTINGS LIMESTONE TILL PLAINS
10 ROCKCROFT LIMESTONE PLAINS
D ROCK KNOB UPLAND COMPLEX
5 LIMITED PRECAMBRIAN RIDGES
14 DRIFT OVER CRYSTALLINE LIMESTONE
15 ROCK KNOB UPLANDS (UNDIFFERENTIATED)
LAKE SIMCOE

Figure 4.

The effect of this physiographic pattern - or, rather, of the land types - has been to channel and concentrate settlement. The colonization roads were truly successful in helping to settle the Precambrian fringe only where they coincided reasonably well with the land types better suited to agriculture.

Separation in time and separation in location of agricultural settlement have been suggested. Differentiation in forms of agriculture is also present.

Farm settlement had advanced with lumbering operations. When the market (and part-time work) provided by the latter disappeared, depopulation and farm abandonment occurred. In all probability there was little actual regression in the forms of farming since the role of the Shield farm in supplying the shanty market was a minor one (the same roads that aided settlement also facilitated the movement of produce from the well established areas further south). Most of the farms were never much more than subsistence or part-time, supplying the shanty market with a few cash crops, especially hay, wild and cultivated. Rather than a change in the form of farming there was contraction in the amount of land farmed, i.e., abandonment, and also in the returns from farming. Farm abandonment is still taking place, being especially common in the Upland Complex, but the process had begun toward the end of the last century with the northward movement of lumbering. The type of agriculture was mixed farming of a semi-commercial or part-time nature. Today, most of the farms in this area are of a similar type although a dairy emphasis has grown with the advent of the ubiquitous truck.

Except in the larger parcels of better agricultural land, farming is of low status. The bulk of the farms may be classified as self-sufficing, semi-commercial, forest products or part-time. In Haliburton, out of a total of 638 farms in 1941, 442 were subsistence or subsistence-combination, and 50 part-time; nearly three-fourths of the farms in Muskoka were similarly classified.[1] It is almost impossible to classify farms on this basis by visual appraisal only. Regional differences in the agricultural forms are more easily recognized in the field than these statistical separates. Such differences are best exhibited in the Transition Zone along the Paleozoic boundary where regional differences south of this boundary have been duplicated in the adjoining part of the fringe.

A short classification of the major forms is given here:

1. Livestock Combination. Based on beef cattle, hogs, and occasionally sheep, together with the production of small amounts of milk for cream (more rarely, as in Muskoka, for a local fluid milk market).

   Areas: Muskoka Corridor, Haliburton Re-entrant, Western Transition Zone, Hastings-Renfrew Bridge.

2. Dairy Combination. In which the production of beef and/or hogs is only slightly less important than milk.

   Areas: Matchedash Clay Flats, parts of eastern section of Transition Zone.

3. Dairy Specialization. Production of milk for cheese and butter, etc. In this combination a lesser accent is placed on beef and poultry production.

   Areas: East-central border Transition Zone from Madoc to Pakenham, including Hastings Limestone Outliers, the Frontenac Axis.

4. Livestock Combination. Where cash grains (feed) enter quite strongly into the economy together with the production of beef, milk, hogs, sheep and poultry.

   Area: Mainly Renfrew Lowland.

---

[1] 1941 Census of Canada. The 1951 Census shows 350 farms in Haliburton and 655 in Muskoka; 40 per cent and 47 per cent of these, respectively, were classed as "small Scale" (i.e., value of products sold less than $250) or part-time.

5. Non-regional Types. Generally subsistence or part-time farms where agriculture is based on less intensive methods with little production of forage crops and greater use of pasture and rough grazing (including bush). This is best considered as bush.

Area: The Rocky Sandy Uplands.

Even in the first four groups outlined above the commercial type farms, i.e., deriving over 50 per cent of the gross income by sales of produce from the farm, are often overshadowed, numerically, by the subsistence or part-time farm. Nevertheless, the pattern is broadly the pattern of the farm economy found in the adjacent agricultural areas south of the Shield while the markets, too, are the markets developed in the agricultural south.

Intensity of land use (and, therefore, density of farm population).

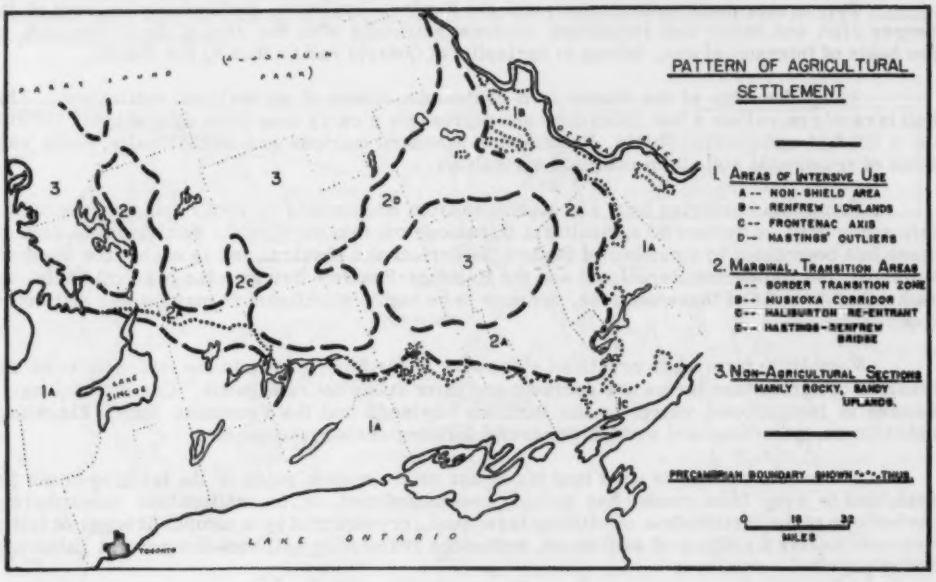

Figure 5.

Intensity of land use (and, therefore, density of farm population) shows close correlation with the land types. (Figure 5) Areas of intensive land use occur in the Renfrew Lowlands and the Frontenac Axis - sections belonging to the Lake Plain and Minor Ridge Land type - and in the Hastings Outliers where intensive land use is associated with shallow, less acid drift over the relatively even surface of sedimentary limestone.

Areas of lower use intensity are grouped under the general term "Marginal Transition Areas". The latter includes the "Border Transition Zone" where farm settlement has been maintained because of proximity to Lowland Ontario, because of frequent pockets of better soils common to the Rocky Ridge and Pocket Land type, and, occasionally, because of the occurrence of less acid drift over crystalline limestone. The Muskoka Corridor lies astride the Muskoka Road, partly in what were Free Grant Lands; the reasonably useful farm areas are restricted to sections covered by sands, silts or clays deposited in glacial Lake Algonquin; the corridor nature of the area, connecting northern and southern Ontario, and the tourist industry have also assisted in maintaining agriculture here. In the Haliburton Re-entrant the colonization roads (the Bobcaygeon and Monck) and Free Grant Lands assisted in directing the pattern of settlement but the last was proscribed, fairly definitely, by the distribution of lacustrine sands and silts found in the Gull and Irondale valleys. The last of the marginal transition areas, the

Hastings-Renfrew Bridge, follows the Hastings and Opeongo colonization roads and, while occasional pockets of reasonably good land occur, it seems likely that the location of these roads was the most important factor in the disposition of settlement here.

Most of the region of the Rock Knob Upland Complex is non-agriculture. Much of the area is unalienated, part has been withdrawn from settlement, e.g., Algonquin Park, and most remains unpopulated. There are occasional farms and certainly there are some pockets of good soils but the latter are not used or have been abandoned because of isolation.

Thus, the pattern of agricultural settlement on the Precambrian fringe is fairly simple.

Most of the region is physically incapable of maintaining commercial forms of agriculture. While further farm settlement might be possible, such extension is neither likely nor desirable.

Two areas, the Frontenac Axis and the Renfrew Lowlands, particularly because of the deeper drift and better soil resources, contrast markedly with the rest of the fringe and, on the basis of intensity of use, belong to agricultural Ontario rather than to the Shield.

Along the edge of the Shield is a continuous ribbon of agricultural settlement. This belt is rarely more than a few miles deep and represents a carry over from agricultural Ontario on to the non-agricultural Shield. Proximity to southern markets and, occasionally, local sections of reasonable soils help maintain agriculture.

From this bordering belt, and separated from one another by rocky uplands covered by thin sandy drift, a number of agricultural intrusions cut into the Shield. Settlement in each of these has been aided by a number of factors, historical and physical, but in each - the Muskoka Corridor, the Haliburton Re-entrant and the Hastings-Renfrew Bridge - the physical basis, the rather better soils of these sections, appears to be highly significant in maintaining settlement today.

Very little farming is practiced elsewhere on the Shield; even in the last mentioned extensions of agriculture farms are sporadic and farm areas not contiguous. Commercial agriculture is insignificant except in the Renfrew Lowlands and the Frontenac Axis. Elsewhere subsistence, part-time and semi-commercial farming are commonplace.

There is certainly as good land not in use as there is in many of the farming areas but such land is away from roads, has already been abandoned, or is unalienated. Nevertheless, the pattern of the distribution of utilized farm land, crystallized by a natural process of selection over nearly a century of settlement, coincides reasonably well with the general pattern of better physical resources.

THE DAUPHIN AREA

AN EXAMPLE OF REGIONAL DIFFERENTIATION IN THE CANADIAN WEST[1]

John H. Warkentin

University of Toronto

Small centres, existing on trade from the surrounding farms, develop in an agricultural area. The local shipping points provided by the railways are the natural locations for those economic and social facilities on which farm families make steady and frequent demands. Later as services become more specialized, the factor of distance travelled gives way to factors of price, quality, and variety of selection. Eventually, therefore, two types of trade centres tend to develop - dependent villages supplying the daily needs of, and therefore readily accessible to farm people and large independent towns which have specialized goods and services in addition to staples. This distinction is emphasized by improved transportation. Also in time, professional and more varied social facilities tend to be established in a centre with a large number of potential customers.

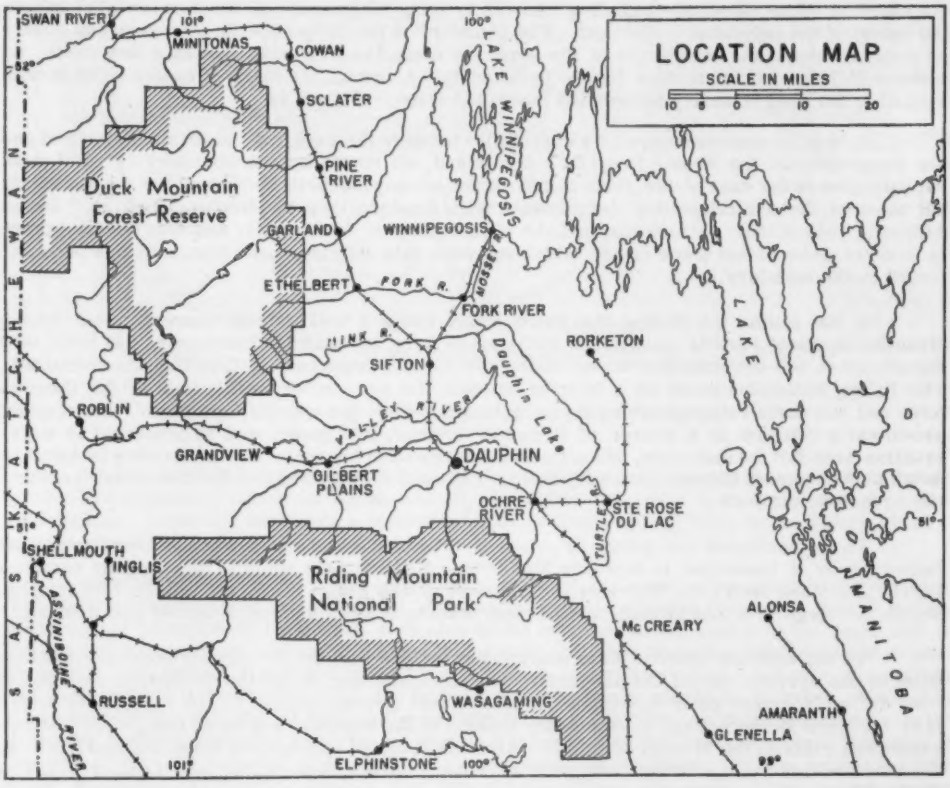

Figure 1. Location Map of Dauphin Area.

---

[1] Paper presented at the January 1954 meeting of the Southern Ontario Division of the Canadian Association of Geographers in Hamilton, Ontario.

LIMITS OF THE DAUPHIN AREA

Dauphin, Manitoba, (population 6,007 in 1951) is one of the larger independent towns referred to above, which dominates the trade area of many neighbouring villages, because it not only has a wider selection of goods but also amenities such as theatres and a liquor commission. It is also a distributing centre for wholesale goods, soft drinks, and a collecting centre for some farm produce. The Dauphin Area as defined in this paper is the economic, social, and administrative hinterland of the town of Dauphin. Such a definition may be considered arbitrary but in the case of Dauphin it is useful because the territory is large enough so that a perspective may be obtained of the geography of the Manitoba Escarpment where the conditions, compared to the rest of the West, are quite distinctive, and yet the territory is small enough that a sufficiently intensive study may be made in the space available to obtain an understanding of the character of the Area.

In Figure 2 the boundaries of the hinterlands of various selected Dauphin services are shown. Similar boundaries indicate hinterlands from which Dauphin receives produce. The limits of the Dauphin Area are then determined from the many overlapping hinterlands. For example, where there are empty areas or where there are barriers to movement a multiplying of boundaries occurs. The boundaries do not overlap to any extent in transition areas where the effect of other independent trading centres is felt. The nature of the service also affects the extent of the individual hinterland. The boundary of the Dauphin Area was drawn as nearly as possible where the boundaries of the separate hinterlands overlap, but in a few cases, as mentioned below, other factors had to be taken into account. To make it easier to work with statistics the final boundary follows the municipal lines. (Figure 4)

As can be expected there is a correlation between the extent of Dauphin's hinterland and the topography of the Area. Dauphin's hinterland, as shown by the boundary 'girdle' does not extend very far east of Ste. Rose and Rorketon simply because there are few people there, but most of the administrative departments with headquarters in Dauphin, such as "Indian Affairs", extend their jurisdiction to Lake Manitoba. For this reason, and also because there is no other independent trade centre which supplies this district, Lake Manitoba has been selected as the boundary.

In the south, the Riding Mountains would make a well defined boundary, but Riding Mountain National Park is included in the Dauphin Area because the 'mountain' has been very significant in the development of the Area, and is still important in affecting its character. The Riding Mountains acted as a barrier between the pre-railway settlement in the Dauphin Area and the early railways of southern Manitoba. Also the wooded 'mountain' was of great use to early settlers as a source of firewood, lumber, and game, and at present it is a recreation area for the residents. Many Dauphin stores have branches in Wasagaming in summer to take advantage of the tourist trade, and as Figure 2 shows, some of the individual boundaries do include the Park.

To the southeast and southwest there are no such clear cut landscape boundaries, but rather zones of transition to southern Manitoba - nevertheless some of the Dauphin services extend into those districts. Therefore, the boundary was drawn where the influence of Dauphin begins to merge with that of other independent trading centres such as Neepawa and Brandon.

To the west the Dauphin Area boundary coincides with the Provincial boundary because most of the service and all the administrative functions stop at Roblin, located at the head of "the Valley"[1] - the 'pass' through which the easiest communication can be had with the highland. (Figure 3) Moreover, the morainic terrain of the highland begins to merge into the Saskatchewan Plain in the vicinity of Roblin. Also the zones of influence of Kamsack and Yorkton, the two nearest Saskatchewan independent trading centres, here come into contact with that of Dauphin.

Duck Mountain Forest Reserve is included in the Dauphin Area because in the past its timber resources were largely developed by lumber companies with mills located in the area, and at present the people of the area still make use of timber from the Reserve for lumber and fuel.

---

[1] The valley between the Duck and Riding Mountains is called "the Valley".

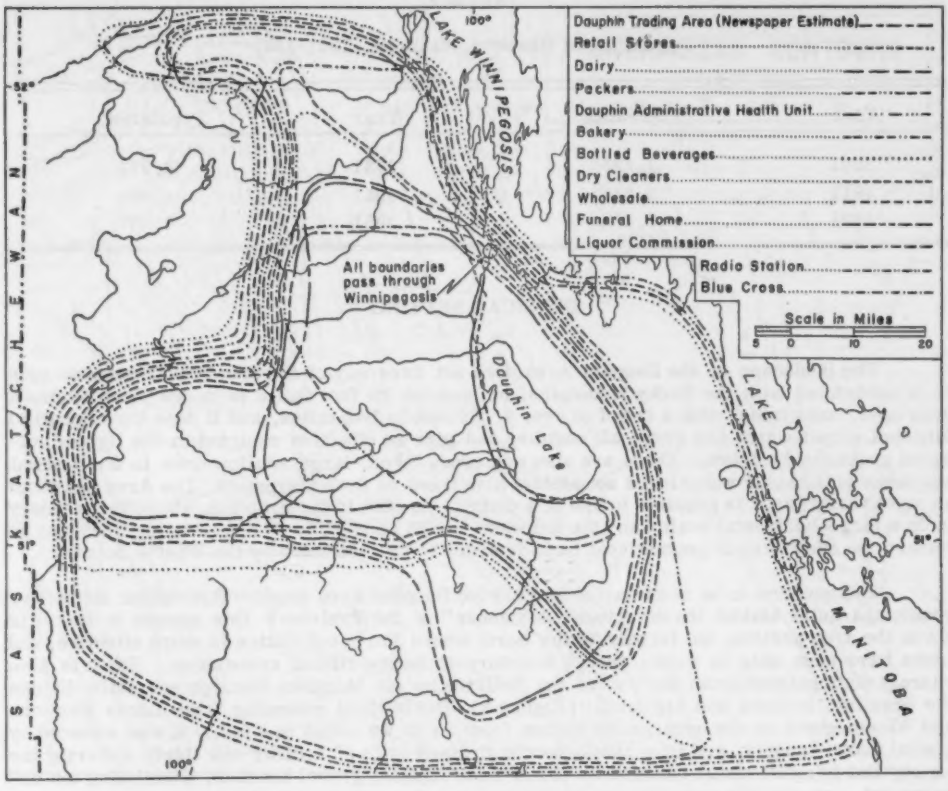

Figure 2. Hinterlands of the town of Dauphin.

To the north the boundary is based on the density of settlement; the population density gradually decreases towards the north, and yet what settlement there is is completely dependent on Dauphin. There is, however, a settlement still further north at Swan River Valley which is almost completely independent of Dauphin.

Dauphin is the centre of this territory of about 96 x 124 miles for a number of reasons. The first settlers located in the district in the vicinity of the present Dauphin - thus it had the advantage of being established first. It is also at the entrance to the Valley to the west, and on the road to the northern lowlands, so people entering the Area from the southeast had to pass through it. Therefore, it was the largest settlement in pre-railway days, and when the railway was built in 1896 it was natural that the railway divisional point should be Dauphin. Since then it has become the highway as well as the railway focus of the area, so that its status as an independent trading centre is assured as long as agriculture is the main economic resource in the area. Once the impetus was supplied by transportation facilities, trading establishments, small wholesale distributing houses, and government offices followed. After an independent trading town gets established it expands until it is capable of providing for the needs of its hinterland, and then an equilibrium is reached in development, unless a change in function such as industrialization occurs. Dauphin has maintained a steady population increase since 1911, after having more than doubled its population between 1901 and 1911. The wartime boom, during which there were two air force training stations near Dauphin, resulted in an increase in population which has been maintained by the post World War II agricultural prosperity. The population will probably remain fairly much as at present, because the increase of the last decade is largely due to an expansion in service facilities for the agricultural hinterland, not due to the development of new sustaining industries.

TABLE I

Population of Dauphin, Manitoba, 1901-1951

Year	Population	Year	Population
1901	1,135	1931	3,971
1911	2,815	1941	4,661
1921	3,885	1951	6,007

PHYSICAL SETTING

The landscape of the Dauphin Area does not have any of the spectacular scenery such as is associated with the Rocky Mountains, but despite the fact that it is in the Great Plains it does have 'mountains' with a relief of over 1,000 feet in five miles, and it does have beautiful forested slopes which are green all summer and give an effective contrast to the lighter coloured grain fields below. There are also numerous lakes, large shallow ones in the lowland, and many small clear water lakes set amidst pine trees on the escarpment. The Area has about as much variety as it is possible to find in a district its size in the Prairies, where the scenery is on a large horizontal scale, and the onlooker has to be capable of appreciating what may be termed the symmetry of geometrical lines in order to be captivated by the West's beauty.

The question to be answered is how did the Dauphin Area acquire this rather distinctive scenic character amidst the notorious "sameness" of the Prairies? One answer is that it is not in the true prairie, but further to the north where the precipitation is more effective, and trees have been able to obtain enough moisture to be the climax association. But it is also sharply distinguished from the rest of the Prairies by the Manitoba Escarpment which divides the area into lowland and highland. (Figure 3) The lowland extending from Lakes Manitoba and Winnipegosis to the escarpment varies from 30 to 60 miles in width. It was covered by glacial Lake Agassiz, and is a level, poorly drained plain of boulder-till thinly covering the nearly flat lying Devonian limestone. A few Lake Agassiz gravel beaches, parelleling the escarpment, are not only poor farmland but also block the eastward drainage, causing numerous marshes. Most of the lowland is in the High Lime soil zone of Manitoba. Native vegetation consists of low poplar and willow bushes interspersed with hay meadows and marshy areas. This kind of landscape, largely unmolested by man, still predominates in the district between Lakes Dauphin and Manitoba. The most fertile areas of the lowland are the district at the foot of the Riding Mountain scarp (called the Riding Mountain Wash), the Valley, and the flood plains of some of the rivers. Most of these soils are degraded chernozems and are agriculturally very valuable. Predominant land use here is grain growing and depending on when one sees these districts the landscape will vary from drab empty plow land to a landscape full of motion when the grain is nearly ripe and the winds are playing with the crops. Many small streams run down the escarpment and meander through the lowland, flowing in steep valleys about 15 feet deep and about 50 feet wide with belts of trees growing on both sides. The aimless courses of the streams across the lowland give an impression of casualness in a landscape which otherwise consists of a strict pattern of uniformly laid out grain fields.

The escarpment has a steep eastward facing slope about 500 to 800 feet high for most of its length in the area. It is only broken by the broad, gently sloping, re-entrant Valley. The Cretaceous strata which form the escarpment dip almost imperceptibly to the west. Morainic deposits cover the dip slope, forming a rough hummocky terrain, which is almost entirely covered by spruce and pine forests. In the west the moraines grade into the smoothly undulating park-like topography of the Saskatchewan Plains.

Dauphin has an average annual precipitation of 17 inches. The precipitation is slightly more effective in the Dauphin Area than in southern Manitoba. There is more frost danger on the highland than in the lowland, but this difference is not sufficient to affect agricultural practices.

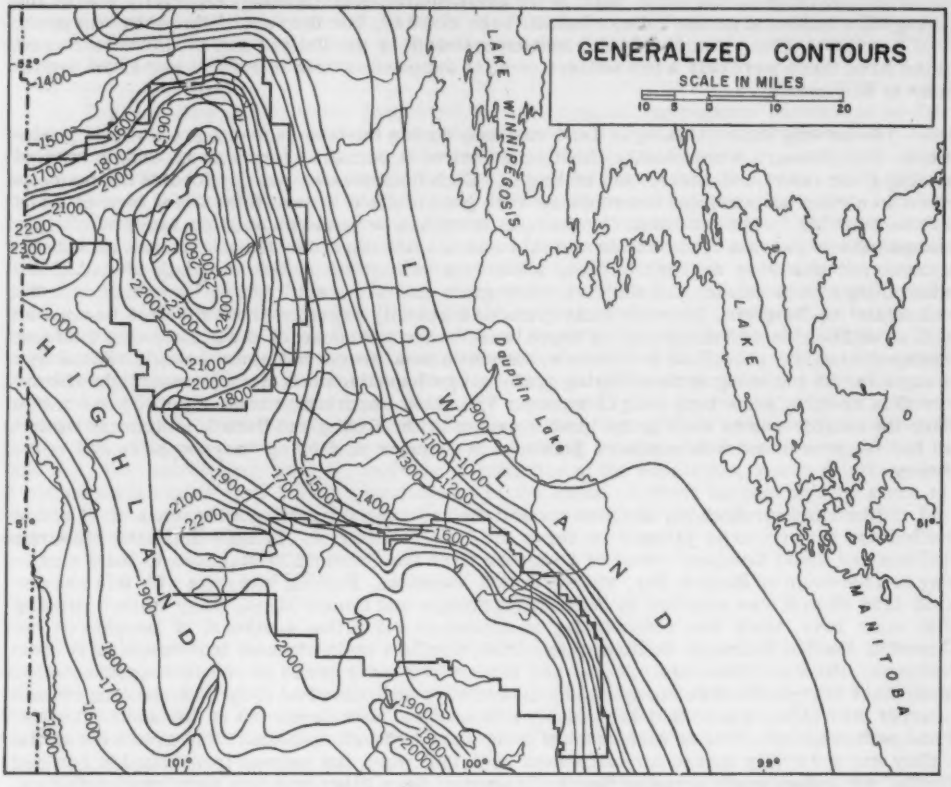

Figure 3.

SETTLEMENT

The processes which have produced the present landscape of the Dauphin Area can best be understood by considering the development of settlement. The first route proposed for the Canadian trans-continental railway went through the Dauphin Area, crossing Lake Manitoba at the Narrows, and then proceeding northwestward between Lakes Winnipegosis and Dauphin, around the Duck Mountains into Assiniboia. This plan was later abandoned for the present southern route of the Canadian Pacific Railway, and so the Dauphin Area did not receive rail service until 1896, whereas such a point as Calgary, for example, had a railway by 1883. Western Canadian settlement usually followed, or just preceded, the railways, and therefore settlement north of the Riding Mountains was retarded until that district too was reached by rail.

The first settlers came into the Dauphin Area in 1881, settling in the district about Shellmouth. This settlement, however, is on the southwestern fringe of the Dauphin Area, and it was not until 1883 that the first settlers took up land north of the Riding Mountains. These came in by a trail along the foot of the escarpment, and settled near the present town of Dauphin. A separate French colony was founded in the Ste. Rose district. A mission station had been established there in 1875 to minister to the needs of Metis who had migrated there after the Red River troubles of 1869. These cannot be classed as settlers because they were merely using Ste. Rose as a headquarters between hunting and fishing excursions, and by 1889 they were beginning to be displaced by French Canadians from St. Vital, and even by French families from France. By the time the railway was built a considerable number of settlers had entered

the area, and those fertile lands which were available for homesteading, especially east of the Riding Mountains and in the Valley, had all been claimed, but the rest of the Area was practically empty. There was hardly any settlement north of the Valley, and in the western part of the Area there were only a few settlers south of the present town of Roblin, and at the settlement at Shellmouth.

Relatively little breaking of land was done during thirteen years of pre-railway settlement. The pioneers were mostly subsistence farmers because there was no easy means of hauling grain out of the district and selling it. Each homesteader usually located his home as close to a river as possible, where there were good bluffs of trees, from which logs could be obtained for his house and barn. In the open stretches he would plant a few acres of grain - enough oats to provide feed for his animals and a little wheat for flour. Without an outside economy, it was very difficult to make any money with which to buy clothing, utensils, and other things from outside the district. Any grain and stock sold had to be hauled over the 'mountain' to Neepawa, but very little grain was actually exported from the area because as well as difficulties of transportation there were many instances of the grain being too frost damaged to make good flour. However, as settlement proceeded some outside capital was brought in; the incoming settlers buying grain and perhaps livestock from the established farmers thus creating some turn over of money. The most important means of getting essentials from the outside was to work in the lumber camps in the Riding and Duck Mountains in winter, or for the men to work in southern Manitoba in summer and bring back supplies and some money.

The railway which the Dauphin community had been demanding ever since it was first settled was not primarily planned to serve the Dauphin district. In 1889 the Lake Manitoba Railway and Canal Company obtained a charter from the Province of Manitoba to build a railway to Tidewater on Hudson Bay, via Northwest Manitoba. Nothing was done with this charter until 1896 when it was acquired by William Mackenzie and Donald Mann. They started building that same year, their line commencing at Gladstone 145 miles southeast of Dauphin on the Canadian Pacific Railway. In November, 1896, the first train steamed into Dauphin. A boom followed. Much new land was broken, and lands which were owned by the railway were sold. Many East Europeans were brought in by the railways and placed on the poorer lands north and south of the Valley, where they laboriously proceeded to hack farms out of the bush. The Ste. Rose settlement received an increment of Belgian and French settlers. The area west of the Valley was not really opened for settlement until 1901 when the railway from Dauphin reached Roblin, the line meanwhile having been built north to Swan River and then west into Assiniboia. At Roblin a cosmopolitan group of people including Slavs, Anglo-Saxons, and Germans settled more or less contemporaneously. Icelanders also migrated from Gimli and started a fishing industry on Lake Winnipegosis in 1900.

Later settlement has intensified but not altered the pattern evolved during the first decade after 1896. In general the Anglo-Saxons settled the better lands, and when they attempted to farm poor lands like those east of Lake Dauphin they usually gave up because they would not tolerate the subsistence standard of living necessary during the first years of developing a farm in that unpromising area. Therefore, ethnic groups such as Ukrainians, Russians, and Roumanians have settled the district about Rorketon and along the railway line north of Dauphin.

REGIONS

Even though the Dauphin Area does not coincide with a physiographic province, geomorphological processes have aided in making Dauphin a centre, because the Valley, in which Dauphin is located, cuts across a parallel arrangement of north-south topographical features. Hence the Dauphin Area is to some extent knit together by its physical configuration - especially in its effect on the economic and social hinterlands of the town of Dauphin. From this wider perspective a Dauphin Region composed of the Dauphin Area can be conceived, but it is not a near uniform region which is apparent to the eye. As studied in this paper the Dauphin Area is a useful device for defining a section of the Manitoba Escarpment of diverse landscape which, nevertheless, has sufficient unity - substantially due to the nodal function of Dauphin - to make it possible to examine the development of a large area as an integrated whole insofar as the general geographic aspects, and especially the settlement processes, are concerned. The limits of the Dauphin Area were determined by interviewing people and studying statistics, so

that Figure 2 is really a cartographical representation of range of function, and not a map which shows something that can be perceived in the field such as land use or vegetation. However, the interactions of structure and process in the Dauphin Area have produced a number of distinctive landscapes or near uniform regions.

There is some order to the forces which have created the regional contexts to be discussed, because geographical regions are not just the result of haphazard phenomena nor have they spontaneously emerged on the earth's surface. That is what makes it possible to obtain a truer understanding of the landscape. The physical variations within the area are a factor in themselves in the development of the regions. Different human responses have also resulted from the various physical challenges presented by the environment, indeed, different, even when the environments have been similar. The historical and cultural factors are very important in the development of the regions, because different ethnic groups settled in the Area in different places at different times; thus new elements were disturbing old harmonies and establishing new equilibria. The route followed by the railway, and space relationships within the Area and with other parts of the West are additional important causal factors in differentiating regions. Naturally the regions do not exist as observable units of the landscape, but the interrelationship of many physical and human factors has given different parts of the Area characteristics which can be recognized and delimited conceptually as geographic regions. These contrasting regions contribute to the understanding of the geography of the Area by throwing it into relief. The regions can best be recognized by taking into consideration the variations in land use, the distribution, density, and ethnic character of the population, space relations and transportation routes, and social organizations in the Area. A short account will be given of each of these factors before the regions are described in order to acquaint the reader with the over all picture in the Area.

Land Use

The land use is determined by the physical conditions, kind of settlers, state of farming technology, and general economic conditions. In the east there is a little subsistence agriculture and some fishing in Lake Manitoba. Centred in Ste. Rose and extending north to Rorketon and west to Ochre River is a dairy area. Most of the products are shipped to a cheese factory and dairy at Ste. Rose. There is some ranching on the meadows bordering Lake Dauphin.

Intensive grain farming, with some livestock in combination is practiced in the Valley and on the Riding Mountain Wash. North of the Valley, in the district settled by Ukrainians, are many more or less self-sufficient farms. Each has some livestock and a few acres in crops.

In the west there are many poor farms on the morainic slopes between the Duck and Riding Mountains. Near the Saskatchewan border large scale grain farming is important.

Lumbering used to be important in the Duck Mountain Forest Reserve before the First World War, but now there are only a few portable sawmills making use of the timber for commercial uses. Riding Mountain National Park is an important tourist centre.

Population

The population of the Dauphin Area was 44,000 in 1951. The population is densest in the Valley and on the Riding Mountain Wash, where there is an almost continuous succession of farms. None of the villages in these districts, except for Dauphin, has a population of over 1,000. The districts about Ste. Rose and north of the Valley are almost as densely populated however, because most of the sections are now supporting farm families. The villages in these districts are smaller, except for Winnipegosis which is a fishing as well as an agricultural centre. North of Pine River the farms are either near the railway, or along the fertile river flood plains. The Roblin district varies in population density. Some parts of the district have only poor farming land; accordingly there are only a few scattered farms, and a correspondingly low number of people. Other parts have very large farms and thus also a sparse population. Roblin, the main centre on the Escarpment, is increasing in importance as more land is being broken and its farm hinterland is being used more intensively.

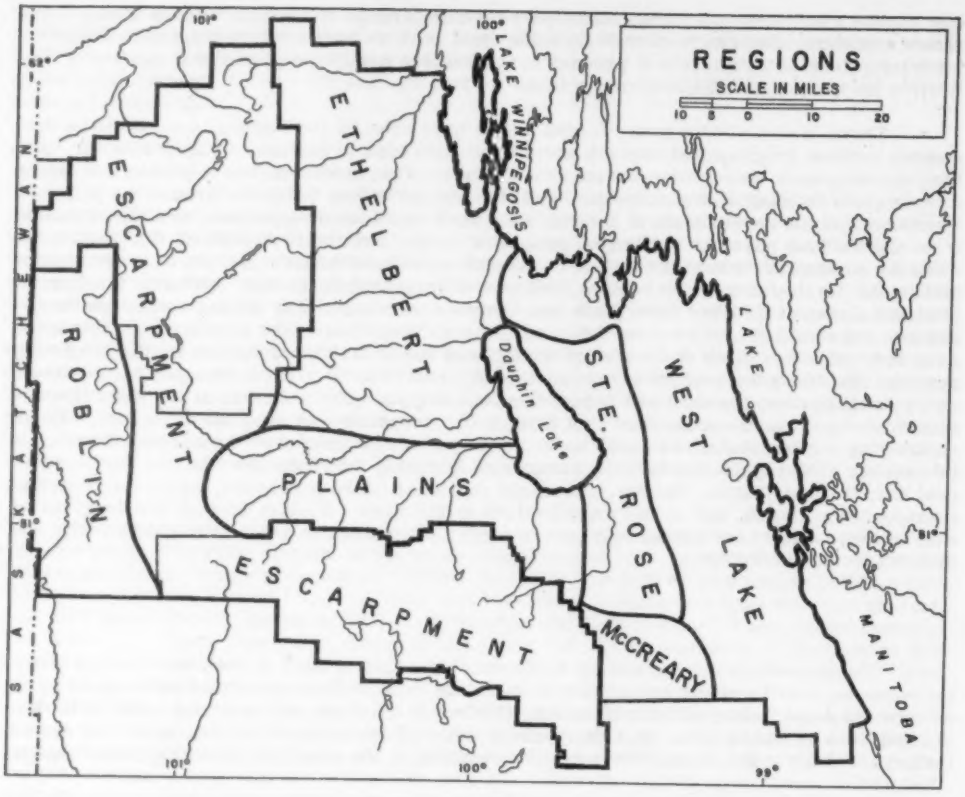

Figure 4.

In the eastern part of the Dauphin Area, the density of population is very low.

The distribution of ethnic groups is interesting because it reflects the development of settlement in the area. The Ukrainians have spread southward into the Valley from the block where they were settled, by buying out retiring Anglo-Saxon farmers. They are also moving northward into the "bush lands" west of Winnipegosis, and are moving into the area east of Lake Dauphin, where they have met the French near Rorketon. This expansion of the Ukrainians is causing some social friction, especially when they move into the areas which were originally Anglo-Saxon. The Roblin district is quite cosmopolitan. Here there are fewer social problems because various ethnic groups settled more or less contemporaneously, developed the district together, and learned to understand each other's ways.

Space Relations and Transportation

The transportation routes are centred on Dauphin. The pre-railway trails led to Dauphin. One skirted the eastern side of the Escarpment, another was over Riding Mountain, and the third was built from Russell and then through the centre of the Valley. In 1896 the railway selected Dauphin as its divisional point, and thus became the railway centre of the Area. All the provincial highways in the area go through Dauphin, except in the west where one trunk highway now goes directly south from Roblin, and has made that district less dependent on Dauphin. These transportation routes are very important in maintaining Dauphin's position

as an independent trading centre. Each of the smaller towns is situated on a provincial trunk highway, and is also the centre of a network of municipal roads which bring in trade. The populations of villages and the areas of their hinterlands have remained fairly constant since the 1920's. Any present growth in population of a town is not due to the extension of its hinterland, but because of more intensive land use in the existing hinterlands. Winnipegosis, Grandview, and especially Roblin have been growing for this reason.

Labour Income

Since this is an agricultural area, prosperity is greatly influenced by external economic conditions and by climate. Agricultural practices in different parts of the Area are quite different, so that a change in either economic conditions or climate has a varying effect over the Area. The diversified farms are better able to meet the fluctuations of price and weather. The new farms being cut out of the bush are usually subsistence farms for the first ten years or so anyway, because the farmers generally do not have enough capital to break the land in anything but piece meal fashion. Naturally, such areas were the least affected by the economic depression and drought of the 1930's, simply because they had never been developed very highly, and could not, therefore, so to speak, suffer very much.

Society

The social organizations, traditions - such as they are - and customs vary among the different ethnic groups, but are all centred in the villages. Dauphin, it is true, serves the whole area in matters such as health, liquor commissions, and some forms of entertainment like hockey, but everyday social life is rooted in the villages. These, therefore, are small regional social centres. Space relations are also important - though the inhabitants of the Valley and the Riding Mountain Wash area have a similar Anglo-Saxon origin, they have very little social contact because of distance between them. The French settlement at Ste. Rose is an insular community, dominated by the Roman Catholic Church. In Rorketon there is a somewhat polyglot atmosphere because of the mixture of peoples - but Slavic customs are beginning to predominate. The centre of Ukrainian activity is in Ethelbert, where the Ukrainian Old World customs have, in many cases, not been changed. However, the Ukrainians are becoming increasingly important in the Valley and here they are adopting Anglo-Saxon customs in most things, and are also adopting the English language. In the Roblin district social life is well integrated between the different ethnic groups as mentioned, but each still retains its specific identity through affiliations with church groups. It is important to realize that these little villages are more than just delivery trading centres, they are also distinctive social centres for different ethnic groups.

By considering the various factors already described, by studying their distribution and interrelationship in the area, and by taking into account the physical features, the Dauphin Area has been divided into seven near uniform regions. In most regions moreover the regional bond of similarity of process - of the forces active in the development of the region - is as strong as the similarity apparent to the eye and also gives the region identity, and this has been especially useful in delimiting the boundaries.

The West Lake Region

This comprises the poorly drained and poorly developed soils of the Lake Agassiz lacustrine plain, and is largely covered with scrub. The inhabitants are poor and widely scattered. They are predominantly Ukrainian in the northwest, and French and Metis along the Lake Manitoba shore and in the southeastern section. There are also three Indian Reservations in the region. Life is almost exclusively based on subsistence livestock farming, and on some fishing in the districts near the lakes. The marginal existence of the inhabitants is the chief human characteristic of the region. The only villages in the region are Alonsa and Amaranth, both in the south. The other trade centres are Ste. Rose, Rorketon, and Winnipegosis, all outside the region.

The northern and eastern boundary is Lake Manitoba, and in the west the region is delimited by the Mossey River alluvial soils, the railway to Rorketon, the Turtle River alluvial

soils, and the Riding Mountain Wash. The West Lake Region does not end at the southern boundary of the Dauphin Area, because this landscape and land use continue up to the southern end of Lake Manitoba.

The Ste. Rose Region

The soil of the Ste. Rose Region is only a little better than that of the West Lake Region, because it too is developed on the Lake Agassiz lacustrine deposits. However, it does include the alluvial flood plain soils of the Turtle River which are excellent for mixed farming. Most of the agriculture is based on cattle; both beet and dairy products are produced and there are even a number of cattle ranches along the eastern side of Lake Dauphin. The cream from the dairy farms is usually shipped to Ste. Rose for processing. This region is also characterized by the French settlement at Ste. Rose, from where many French have spread northward, and also westward into the West Lake Region. To the south and east this region is culturally and socially quite distinct from the adjacent regions; but to the northwest there are more Ukrainians and Germans, thus forming an ethnic transition area to the Ethelbert Region to the west. The two centres in this region are Ste. Rose which is French, and Rorketon which, although cosmopolitan, is predominantly French and Slavic.

Only the lake limit of the region is distinct. The western boundary is Lake Dauphin, and the area of transition between Ochre River and Ste. Rose. Ochre River's economy is based on mixed farming similar to that of Ste. Rose but the inhabitants regard Dauphin, and not Ste. Rose as their commercial and social centre. The southern boundary, which lies between Laurier and McCreary, is based on trade centres and location of ethnic groups, as well as on land use.

The Ethelbert Region

This is also on the Lake Agassiz plain, but adjacent to the Escarpment, and the rivers flowing into Lake Winnipegosis and Lake Dauphin from Duck Mountain, have left valuable alluvial soils along their borders. The agriculture is mostly mixed farming, locally termed "bush farming" because each farm appears to be hacked out of the bush. The Ukrainian farmers who live here still have the self-reliance required of a pioneer. There is not the same concentration on cattle here as in the Ste. Rose Region; each farm has a few cows, pigs, and poultry, along with a few acres in grain. Settlement is concentrated on the better soils along the Mossey, Mink, Fork, and Pine Rivers, and also, for transportation reasons, along the railway line going to Swan River. Except for Winnipegosis and vicinity it is an almost purely Ukrainian settlement, and still at a relatively early stage of development as shown by the many small hamlets, some with only a store and a garage or two, which serve the farmers. The principal centres are Ethelbert, Sifton, Fork River, and Winnipegosis. Winnipegosis with its fishing industry is distinctive in the region, but it is becoming increasingly important as an agricultural centre and is included in the Ethelbert Region because its agricultural hinterland is typical of the farming in this area.

The northern boundary is the mixed forest which is the limit for agricultural settlement, and the western boundary is the Duck Mountain Forest Reserve. In the east it is bounded by Lake Winnipegosis, the Mossey River alluvial soils, and Lake Dauphin. In the south the boundary is drawn on a cultural as well as a physical basis; being placed where the richer soils of the plains begin, and also where the population is no longer purely Ukrainian.

The Plains Region

This is the best agricultural district in the Dauphin Area. It has the best land, and on the average the most prosperous grain farms. The entire Plains Region was originally Anglo-Saxon, but at present there are equal numbers of Anglo-Saxons and Ukrainians. The important centres are Dauphin, Gilbert Plains, Grandview, and Ochre River.

The Plains are fairly clearly delineated on all sides except for the eastern margin. To the north they are bordered by the Ethelbert Region, and to the West and south by the Escarp-

ment Region, made up of the Forest Reserve, subsistence farms, and the National Park. The Ochre River mixed farming area to the east is included because it is economically and socially linked to Dauphin. In the southeast the Plains Region grades into the McCreary Region, where the land use is similar but the region has a different locus.

The McCreary Region

This region consists of the Riding Mountain Wash which forms a narrow belt of valuable grain and mixed farming land. The soils are degraded black earths, the same as in the Plains. There is very little social communication between the Plains and the McCreary Regions; and, the McCreary Region differs in both land use and ethnic groups from the Ste. Rose Region. Therefore, it has been designated as a separate region. The district of livestock farming near Laurier distinguishes the McCreary Region from the Plains Region in the northwest. In the north, the boundary is the French settlement of the Ste. Rose Region. To the west is the Park and to the east an area of poor soil. The southern boundary of the McCreary Region is not that of the Dauphin Area, but consists of a transition area towards Neepawa.

The Escarpment Region

This includes the Duck Mountain Forest Reserve, the Riding Mountain National Park, and the divide between them. The Reserve and Park are not open for agriculture and thus are distinct from the other regions. The area between them on the divide was also originally forested and should not have been cleared, and at present only supports subsistence farming. The trading centre for the few people in the Forest Reserve is Grandview; and for the Park, Wasagaming and the neighbouring villages. The boundaries of the Escarpment Region are due to physical factors, and have been reinforced by administrative boundaries.

The Roblin Region

This has a variable landscape changing from the forested, morainic escarpment in the east, to the open prairie to the west. Most of the farms are cereal growing and mixed farming types, although there are some subsistence farms in the pioneer fringe district. This is a cosmopolitan human region of Anglo-Saxons, Slavs, and Germans, who have a Catholic tolerance for each other's ways because these groups settled the region more or less concurrently and developed the region together. Roblin is the main centre, and Shellmouth and Inglis are smaller ones.

The region is bounded on the north and east by the Escarpment Region, where there is a pioneer fringe district extending along it. The limit to the west is the Saskatchewan political boundary, which is to some extent coincident with a physical limit as well, because the open prairies start west of the area. In the south the Dauphin Area boundary coincides approximately with the southern limit of Roblin's trading area, although a similar land use continues beyond the area.

However permanent these regions may appear to be, they really only exist in time, because there is a continually changing pattern of forces operating in the formation of the regions, so that they are an integrate of time relationships as well as of space relationships. Nevertheless the regions will probably remain permanently differentiated on the basis of land use, especially as man's agricultural techniques improve. The more man knows about the environment in which he lives, the more he seems to be affected by it, paradoxical though it may seem; because in his attempt to make the best and most efficient use of the natural resources he adopts ever more complicated methods to cope with even minor variations in the land. Therefore, any changes in land use will still tend to continue to differentiate the regions. Other changes will occur in the cultural aspects of the regions. A more homogeneous population is evolving now, although this will probably not eliminate the nuclear ethnic areas for some time, especially the French at Ste. Rose and the Ukrainians at Ethelbert. An interesting question is whether these seven regions would have resulted if the entire Dauphin Area had been settled by one ethnic group. Man's adaptation to the varied environment does account for all the regions except perhaps the Ethelbert and Ste. Rose regions which might then have merged

into one, except for the probable changes affected by the secondary trade centres. At present the ethnic groups emphasize the character of the regions, and also affect the location of the boundaries of the regions. The land use and the space relations within the regions are fairly stable and though there is a slight flux in ethnic groups it appears that the regional equilibria will not be sufficiently disturbed to cause any immediate changes in the regions.

Yet despite these regions into which the Dauphin Area has been divided it must be remembered that the Area is still a part of the Canadian West in function, and in outlook, as well as by geographic location. The fact that the lakes are close to where they live, that the mixed forest is to the north, that they live near to an escarpment, is not of immediate significance to the people in their daily lives. Far more important is the local weather, or the price of grain, or the freight rates; but these preoccupations are common throughout the West, and result from the one general economy - agriculture - and the resultant dependence upon the rest of the world. Therefore, Dauphin's function, as an administrative and redistribution centre, is really not different from that of any other town of 6,000 in the West; but its distinctiveness lies in the character of the area which it serves. Further west the independent trading centres serve hinterlands in which in many places man has completely changed the landscape, and made it practically uniform by his agricultural practices. Dauphin's hinterland is not uniform, even after man has developed it for 70 years, but it is very clearly broken up into various landscapes and regions.

In 1883, before settlement, the escarpment was well forested and the lowlands covered with scrub. Man has not changed the landscape to any extent on the Duck and Riding Mountains, except to push through some roads and establish a few resorts. In the Plains, and in the McCreary and Roblin Regions the effect of man is more noticeable. Here fields of grain have to some extent replaced the original park landscape. In the West Lake, Ste. Rose, and Ethelbert Regions man has not made very much of an impression on the original scrub, and has by no means changed the entire landscape. Therefore, man has affected the topography of the Dauphin Area, but not in the same manner or to the same extent in the different parts of the area; nor, if the natural resources are properly administered and conserved, will there ever be a complete denudation of the natural vegetation in the Dauphin Area. In the future the lowlands will be used more intensively than at present, but grain farming will probably never become important in the West Lake Region, and the Escarpment Region should remain largely as at present.

CONCLUSION

The development of the Dauphin Area in the last 70 years is an example of the unplanned opening up of a new country under a largely unrestricted free enterprise system. The settlers on the better lands have prospered, but in the Escarpment Region an inadequate living is being obtained from farming, and the poorer lands in the West Lake region have repelled man's attempt at grain farming. As yet only the most obvious lessons in land use have been learned, and these usually form the success or failure of a standard method of economic exploitation - especially the attempt at wheat farming under almost any conditions.

An idea of the investigations which should be undertaken can be obtained from a brief comparison of the economic accomplishments in the different regions. The Plains, McCreary, and part of the Roblin Regions probably have the correct basic land use, although the land is definitely not being used to its optimum capacity. Here, therefore, recommendations by the agricultural representative on more suitable crops and better farm methods, based upon soil surveys, climate, and economic conditions, should be adequate for the time being, until more urgent problems in the other regions have been investigated. The other regions require detailed, comprehensive, field, and economic studies to determine what is the best type of land use. Natural conditions, past experiences, economics, and the optimum use commensurate with the conservation of resources, must be taken into consideration. These regions should be studied first, because many of the inhabitants have a low standard of living, and assistance is required, especially by devising better land use practices, and by giving aid in carrying them out.

Up to the present, economic development has largely been by trial and error, and this in many places has resulted in the depletion of resources. A regional study of the Dauphin

Area thus points up the fact that there are definite, varied geographic regions within the Pioneer Fringe Region, in which different kinds of economic activity, such as grain farming, mixed farming, part-time farming, ranching, lumbering, fishing, and the tourist industry, are carried on. In an area with such a variety of natural conditions and economic activities it is important that the best use be made of the resources; not just a continuation of the methods which inertia or custom have determined, or which were found suitable in the open prairies of the West.

AN OPTIMUN SIZE FOR CITIES

B. Shindman

University of Toronto

In recent years, faced with the trend within western culture towards increasing urbanization, planners and other social scientists have begun to think about the problem of how far urbanization will go. Should the larger centres be allowed to grow indefinitely in population and area or should the development be arbitrarily stopped. If the development is to be halted, at which stage should it occur with respect to a city's population and area. This question immediately raises the basic problem of what should be the optimum size for large urban centres, known generally as cities.

This problem has been examined by a number of town planners and sociologists. For the most part their investigations have been brief and in many cases quite limited in scope. The criteria used for determining an optimum size for cities have varied greatly. Duncan[1] and Ogburn[2] indicate a selected optimum of 50,000 - 100,000 people, based on the per capita cost of municipal services in urban centres in the United States with a population greater than 25,000, i.e., on a selected quantitative statistical basis without considering, as both Duncan and Thomas Sharp[3] point out, the quality and the scope of these services as well as the length and continuity of their operation. Ebenezer Howard,[4] whose optimum is 30,000 people[5] and Le Corbusier,[6] who considers a city of 3,000,000 as ideal, based their estimates on what they personally believed to be the best size, i.e., their estimates were entirely subjective. Still others like Brennan,[7] whose optimum is 10,000 - 20,000, based their findings on a desirable social life for the inhabitants.

None of these observers, however, mentioned the problems raised by the very meanings of the words 'Optimum Size for Cities'. The Shorter Oxford English Dictionary defines Optimum as being the best or most desirable; Size as being the magnitude, bulk, bigness or dimensions of anything; and City as being a title ranking any urban centre greater in size than a town. The application of these terms to urbanism and to town planning has the following implications.

If one considers an optimum size for cities, the question immediately raised is: The optimum for what? - for internal ease of movement, for economic provision of services, for a desirable social life, for an "urban life" or for defence in time of war, etc. When one considers the word size, its several aspects in this case become rapidly apparent. Urban centres cover a horizontal area and also have a vertical extent. Size here also means total population, a population which can be concentrated by vertical accumulation or dispersed thinly over a broad horizontal area. The word city, according to the above, means an urban centre greater in population than a town. Within our culture the population size for cities has been defined legally. In Ontario, for example, it is an agglomeration of 15,000 people; in Saskatchewan it

---

[1] Duncan, O.T.: "The Optimum Size of Cities", Reader in Urban Sociology, ed. Hatt, P.K., and A.J. Reiss, The Free Press, Glencoe, Ill., 1951, pp. 632-645.

[2] Ogburn, W. F.: Social Characteristics of Cities, International Managers' Association, Chicago, 1937.

[3] Sharp, T.: Town Planning; Pelican Books, London, 1940, p. 69.

[4] Briggs, M.S.: Town and Country Planning; Allen and Unwin, London, 1948, p. 24.

[5] Many followers of the English School of town and regional planners which developed following Howard's Garden City principle believe the optimum size for cities to be 30,000 - 50,000 people.

[6] Jeanneret-Gris, Charles E. (Le Corbusier, pseud.): City of Tormorrow and its Planning, trans. from the 8th French Ed. of Urbanism by Frederick Etchells; Architectural Press, London, 1947, p. 172.

[7] Brennan, T.: Midland City; Dennis Dobson Ltd., London, 1949, p. 47.

is a population of 5,000 people concentrated on 640 acres or less; in Wisconsin it is a population of 1,000 on 320 acres or less. It is quite obvious, then, considering all the implications of the above, that an answer to the question, "What is the optimum size for cities?" can be given only after a very great number of complex criteria have been examined, analysed, weighed and a synthesis attempted in order to resolve the contradictory nature of many of the various factors. Any estimates such as those submitted by the sociologists and planners mentioned would be wholly inadequate unless they were closely linked to the geographic character, distributions and functional patterns of the regions within which the centres were to be found.

Despite this, however, there are several general considerations which do apply to the resolving of the problem. First, size may be taken to refer almost completely to the total population of the urban centre, for the distribution of this population over a horizontal and/or a vertical area will depend on the physical nature of the site and the general cultural levels of all the people occupying the site, i.e., their felt needs and desires for social living and the technical skills they have to translate them into actuality. Secondly, within each major geographic region there seems to be a hierarchy of interrelated urban centres. This hierarchy is based on the services and functions of the individual centres. The interrelationships are not permanent but change with time, i.e., as the culture of the region changes, for example when the automobile replaced the horse as a means of transportation. Within an open economy based on competition, such as one finds in those regions occupied by Western European culture, not only can functions change in the long period of time when the entire culture changes, but they can also change within a short period of time, i.e., within the same cultural period. Within a closed economy, i.e., within a region which is dominated by a single, strong central authority, it is possible for the functions and therefore the hierarchy to remain static or rigid within any one cultural period. Changes in function in this latter are also subject to very tight control by the central authority.

If one assumes that the hierarchy of interrelated functions of urban centres is a valid concept, then one can arrive at an optimum size for each of the centres on the hierarchy. This optimum size cannot have an absolute value but will be a range in population. It will have a maximum and a minimum figure based on the greatest efficiency of operation of all the functions of the individual urban centres. The greater the number of functions for any one centre, the greater this range will be. Whether the efficiency or the degree of efficiency is translated in terms of production or money or social living, etc., will depend on the general culture of the geographic region.

There are, however, a number of cases which tend to qualify this approach to determining an optimum size. These are the urban centres whose functions do not readily seem to fit into any hierarchy, such as resort towns, military towns, university towns, or isolated mining and pulp mill towns. The optimum, or rather the maximum-minimum range in population for these will vary in a manner similar to those urban centres which find themselves at the bottom of a hierarchy, that is those concerned with the production of primary products. The population will vary as the rate of exploitation of the available resources, be they minerals, timber, fish, university lecturers, or a sandy stretch of coastline in a semi-tropical climate. For the former and for other centres of primary production in a geographic area which has had a relatively long period of settlement, knowing the rate of exploitation of the available resources, the planner can predict quite safely the optimum size for the community whose function it is to exploit or directly service the exploiters of each particular resource, subject, of course, to the vagaries of "market prices". This can be illustrated by a number of Ontario examples. According to the 1951 (9th) Census of Canada, the population of the nation has been growing, over the past four decades, at an average rate of 2.1 per cent per annum (except for the depression decade 1931-41). During the past decade the increase in population has taken place in the urban centres while the rural population of Canada was reduced 6 per cent in relation to the total population. Centres with more or less stabilized single functions showed a general population increase of 0 to 1 3/4 per cent per annum, whereas centres with a number of functions increased at a general rate of 2 to 3.5 per cent per annum. Small farm service and market centres (some with light manufacturing), mining towns and pulp and paper towns illustrate the former. Regional capitals and distribution centres, which are to be found near the top of the hierarchy, illustrate the latter. Table I indicates the stability of population in the former. They are, however, dependent in their size on the population of the hinterland they service. This population is dependent, in turn, on the length of the period of settlement, the patterns of occupation (e.g., farming types) and the resulting density of population. A number

of centres in Lambton County illustrate this point. Although Arkona, Thedford, and Watford fulfil similar functions, the population of each is quite different, although each is stabilized. Oil Springs is an example of what can happen with a change in function. An oil producing centre from 1861-1866 it had reverted to a farming market and service centre by 1871. A boom in the oil industry saw a rapid climb in population in answer to the added function of oil production. The rapid decline of the Oil Springs field shortly after 1901 resulted in the centre again becoming unifunctional, with a stable population unable to maintain many of the former services such as specialized shops. Sarnia, also in Lambton County, is an example of a regional capital performing a number of functions. It provides a number of services for a large hinterland, but this hinterland is limited in extent to the south and east by the service areas of Chatham and London. Sarnia, however, because of its manufactures serves the nation as a whole and Southern Ontario in particular. Its population thus has continued to grow almost directly proportionally to the increase in the manufacturing function, for its other functions such as administration, provision of services, recreation and transportation have remained more or less the same. In this respect one can place it in the rank of small multi-functional regional capitals such as Sault Ste. Marie, Guelph, Brantford, and Kingston.

TABLE I

The Functions and Population Growth of Certain Urban Centres in Ontario

Urban Centre	Functions	Population						
		1891	1901	1911	1921	1931	1941	1951
Arkona	Farm service centre	463	468	424	420	420	406	370
Thedford	Farm service centre	616	633	559	524	559	623	616
Watford	Farm service centre	1,299	1,279	1,092	1,059	979	1,076	1,201
Oil Springs	Farm service centre & oil production	1,138	1,018	646	490	394	458	433
Sarnia	Multi-functional regional capital	6,692	8,176	9,947	14,877	18,191	18,734	34,697
Iroquois Falls	Pulp and paper manufacturing	--	--	--	1,178	1,476	1,302	1,342
Haileybury	Mining	1,299	1,279	1,092	1,059	979	1,076	1,201

New techniques of production may, in time, alter the validity of the production of an optimum in the case of unifunctional centres of the type noted above. With respect to resort centres, as an example of an unstable unifunctional centre, there is less possibility of adequately predicting an optimum size since the frequenting of such places is usually subject to the general felt needs and desires of a great number of people in many regions. The popularity of a particular resort is thus subject to the public whim. When one considers Atlantic City, Blackpool, Miami and even Grand Bend in Ontario, it seems that there is almost no maximum in size to be set. However, the maximum in this case which can efficiently bear the cost of the municipal services for the seasonal maximum; that is the least number of visitors necessary during the season to maintain the "plant" established.

In summation, for a planner or a sociologist or a geographer, or anyone else to predict the optimum size for cities and other urban centres, he must recognize a number of factors. The first of these is that the trend towards urbanization of the world's population is part of general culture change and to attempt to predict where or when it will stop is practically impossible since no man knows for certain what the future holds in store. But one factor that can be recognized and predicted more or less definitely is that each urban centre performs certain functions in relation to all other urban centres and to the area about it.

These functional relationships vary from region to region throughout the world and are inexorably linked to the cultural levels of the peoples occupying the different regions. It must be recognized that these functional relationships are not static, particularly in an economy dominated by competition, but change with time within each region and from region to region as the processes of diffusion and acculturation take place.

For each urban centre there appears to be an optimum range in population based on the efficient operation of its particular functions, subject to the changing values and felt needs of its occupants. Thus it is evident that the optimum size for any urban centre can be determined only after a comprehensive understanding has been obtained of the character and interrelationships of the region within which it is located.

THE CANADIAN ASSOCIATION OF GEOGRAPHERS

THE CANADIAN COMMITTEE OF THE INTERNATIONAL GEOGRAPHICAL UNION

This Committee has now been reorganized under the sponsorship of the Canadian Association of Geographers. Its members, with the organizations they represent, are as follows:-

B. Brouillette (Canadian Association of Geographers) Chairman
I. Bowen (Government of Canada)
P. Dagenais (University of Montreal)
A.T. Davidson (Saskatchewan Department of Natural Resources)
F.K. Hare (McGill University)
D. Innis (Queen's University)
T. Jost (University of Ottawa)
J.R. Mackay (Canadian Association of Geographers)
R.A. MacKay (Government of Canada)
T. Manning (Canadian Geographical Society)
E. Pleva (University of Western Ontario)
D. Putnam (Toronto University)
L. Reeds (McMaster University)
J. Robinson (University of British Columbia)
N. Scarfe (Manitoba Faculty of Education)
T. Weir (University of Manitoba)
W. Wonders (University of Alberta)
N.L. Nicholson (Government of Canada) Secretary

Une Bibliographie Mondiale sur la Géomorphologie Périglaciaire

Le professeur J. Tricart, directeur de l'Institut de Géographie de l'Université de Strasbourg (France), nous informe, conformément à une résolution arrêtée en août 1953, qu'il prépare, en sa qualité de secrétaire de la Commission de Géomorphologie périglaciaire de l'U.G.I., une bibliographie analytique sur le sujet.

Il nous a fait parvenir, en décembre 1954, 14 fiches sur des articles parus en France, et demande aux géographes canadiens de bien vouloir assurer la rédaction de fiches analogues concernant les travaux publiés au Canada sur le périglaciaire. Il prie également les auteurs de travaux sur ce sujet de lui faire parvenir trois exemplaires de leurs publications.

Nous serions très heureux de savoir s'il serait possible qu'un géographe canadien s'intéressant à ce problème puisse se charger de recueillir la documentation et de la faire parvenir soit au professeur J. Tricart, à l'Université de Strasbourg, soit au président de la Commission, le professeur A. Cailleux, 9, avenue de la Trémouille, Saint-Maur (Seine), France.

A World Bibliography on Periglacial Geomorphology

Professor J. Tricart, Director of the Department of Geography, of the University of Strasbourg (France), has informed the Association that according to a decision of last August, 1953, he will prepare an analytic bibliography on Periglacial Geomorphology on behalf of the Commission on Periglacial Geomorphology of the International Geographical Union.

In December, 1954, he sent to the President of the Association, 14 sample notes and articles published in France, and he is asking Canadian geographers to prepare small notes on works published in Canada on the same subject. He is also asking the authors who have published on that subject to send him three copies of the publication.

We would like to know if a Canadian geographer, interested in this problem, would be good enough to collect these notes and send them directly to Professor Tricart of the University

of Strasbourg, or to the President of the said Commission, Professor A. Cailleux, 9, avenue de la Trémouille, Saint-Maur (Seine), France.

UNIVERSITY NEWS

Alberta

Plans are being made to increase the number of geography courses offered, and to provide for a geography pattern for the first time during the academic year 1955-56. The degree will be the B.A. or B. Sc. depending upon the approach the student elects to follow. It is expected that a second geographer will be appointed to join Professor William C. Wonders in implementing this programme.

British Columbia

Enrolments in geography continue to rise at the University of British Columbia. This year there are 730 persons registered in 12 undergraduate courses; there are 40 undergraduate majors and four Honours students; there are six graduate students. Last summer the department set a new record with 190 teachers enrolled in three geography courses. The geography staff remains the same as last year, namely Robinson, Mackay, Chapman and Ruggles.

The research and writing of the staff cover a variety of geographical fields. Dr. J. Ross Mackay received a grant-in-aid from the Canadian Social Science Research Council to study the application of "Social Physics" to geographic problems. Dr. Mackay continues his research into the physiography of the Anderson River area, N.W.T., as the result of field studies and air photo interpretation. During the past summer he led a field party from the federal Geographical Branch to the Mackenzie River delta and Eskimo Lakes area, N.W.T. to continue studies in physiography and air photo interpretation. In the past year Dr. Mackay published four papers on cartographic techniques and two papers on geomorphology of Arctic areas.

Professor John D. Chapman is a member of a university research team studying problems of the natural resources of British Columbia in relation to the Indians of the province. He is also Chairman of a Sub-committee of the British Columbia Natural Resources Conference which is planning the publication of a large "Atlas of British Columbia Resources" in 1956. Professor Chapman also continues his research on methods of Land Classification in the Peace River area of British Columbia. This study is based on several summer field seasons in the Peace River area.

Professor Richard Ruggles is doing research in the Historical Geography and Cartography of Western Canada to 1795.

Dr. J. Lewis Robinson, Chairman of the Geography Division, has continued his studies on the geography of British Columbia, and in collaboration with Professor Chapman, wrote a Grade X geography text for British Columbia schools on "The Geography of British Columbia". During the past year Dr. Robinson wrote five articles which were published in professional journals on aspects of the Geography of Northern Canada, British Columbia, and geography teaching methodology.

Carleton College

Courses in "Elements of Geography" and "World Regional Geography" are being offered during 1954-55 in the Evening Division.

Laval

Au cours de l'été 1954, l'Université Laval a organisé le premier cours d'été en géographie pour les professeurs de géographie de l'enseignement secondaire. Monsieur Louis-Edm. Hamelin a été nommé secrétaire de l'Institut d'histoire et de géographie de l'Université.

Depuis septembre 1954, l'Ecole de Pédagogie de l'Université offre des cours combinés en géographie et de pédagogie. L'Institut de géographie a un professeur de géographie en congé d'études à Paris.

Manitoba

Over 200 students took geography at the 1954 Summer School. This winter the Geography Department has an over-all enrolment, including 200 Engineering students, of 450, the balance being in Arts and Science. During the summer of 1954, Professor T. Weir continued work on the distribution of daytime population and land-use mapping of Greater Winnipeg, for the Geographical Branch. He is also working on an Atlas of the Prairie Region and has assisted the Appraisal Institute of Canada by lecturing on "Neighbourhood Trends". Professor Watts is continuing research on a precise climatic definition of the vegetation zones of the southern Great Plains of Canada. Professor Thomas Barton of the University of Indiana visited Winnipeg during December and gave a special lecture on "Ecological Control of Soil Erosion". He also spoke to the Manitoba Geographical Society on "Atomic Energy and the Ohio River".

McGill

The Department of Geography sponsored the erection of a field research station at Knob Lake in the centre of the Labrador-Ungava Peninsula in 1954. The station was officially opened on October 1st. It will maintain hourly synoptic observations of surface and upper air weather conditions and will be the centre of field studies in several fields within the Peninsula. It has a resident staff of four. Professor R. Norman Drummond is Field Director. Three fellowships worth $2,750 will be awarded annually to assist graduate students to work at the station.

An Arctic Meteorology Research Group was set up under the personal direction of Dr. F. Kenneth Hare. Its work is supported by the Geophysics Research Directorate of the U.S. Air Force Cambridge Research Centre. Mr. Arthur D. Belmont, formerly of the University of California at Los Angeles, has been appointed Research Associate in this group.

The Department will serve as host early in 1956 for the Annual Convention of the Association of American Geographers.

A small number of doctoral fellowships are available for students who wish to work on problems of arctic geography at McGill University. Enquiries should be addressed to the Chairman, Geography Department, McGill University. There is no restriction as to national origin in the award of these fellowships.

McMaster

Mr. L.G. Reeds has completed his manuscript on the agricultural geography of Southern Ontario. This work embraces both historical and contemporary aspects of the subject and is the culmination of several years of research.

Mr. W.H. Parker has commenced research into the historical geography of Canada. He will be lecturing at Oxford University during the Trinity term, 1955.

Mr. H.A. Wood has completed field work in the Department du Nord, Haiti for his study of land utilization in that area in relation to physical conditions. He is at present preparing topographic maps for hitherto little known sections in the interior of the Department.

Dr. H.R. Thompson, who recently received his doctorate from McGill University, has joined the staff this year and will be developing the fields of geomorphology and polar geography at the University. Dr. Thompson is now preparing a series of papers based on his recent researches in geomorphology in Baffin Island.

Montreal

Dr. Jean Despois, Director of the Institute of Geography, University of Algiers, was visiting professor here during the first semester 1954.

Camille Laverdière, formerly employed at the Geographical Branch, Ottawa, has been appointed "assistant" while he works for a Ph.D. at the Department of Geography in replacement of Mr. Marcel Bélanger who is now preparing a Ph.D. at the University of Grenoble, France.

Noël Falaise, professor of geography at the Ecole des Hautes Etudes Commerciales, got a doctorat ès-lettres (geography) for his thesis: "Les îles de la Madeleine", in October 1954. He is now on a leave of absence in Europe where he will spend a couple of years working on special assignments.

Two more Ph.D. and five M.A. degrees are expected to be delivered during the present academic year. Altogether, a total of 20 post-graduate theses are in the process at the Department of Geography.

A Bibliography of New Quebec (1500 classified entries) compiled by J. Cousineau, for the Department of Trade and Commerce, Quebec, is now under press and is expected to be available next summer.

Ottawa

The Department of Geography began its formal graduate programme in September. Two new courses, for undergraduates and graduates were also offered - "Weather and Climate", given by Dr. N.L. Nicholson and "General Photogrammetry", given by Dr. T. Blachut. It is planned to add courses in "The Geography of Canada", "Political Geography" and "Geographical Discovery and Exploration" during 1955-56.

Queen's

Professor Donald Q. Innis is continuing research dealing with the problem of diminishing resources in an expanding economy.

Toronto

The staff of the Department of Geography is as follows: Dr. D.F. Putnam, Professor and Head of the Department; Dr. George Tatham, Professor; Dr. D.P. Kerr, Assistant Professor; Dr. J. Spelt, Assistant Professor; Dr. J. Howard Richards, Mr. Ali Tayyeb, Mr. George Potvin and Mr. J.A. Crosby, Lecturers. There has been no change since last year in the lecturing staff. Recent visiting professors have included Professor T. Greenwood of Montreal and Professor W.B. Fisher of Indiana.

Research projects in progress at the present time include a study of the Holland Marsh by H.A. Smith, a study of recreational land use along some Southern Ontario rivers by W.M. Baker, a study of the process of urbanization in south-central Ontario by J. Spelt, settlement problems in the Gaspé Peninsula by Georges Potvin, Mennonite Settlement in Manitoba by John Warkentin and the Political Geography of Pakistan by Ali Tayyeb.

Professor D.F. Putnam lectured at the University of Alberta during the summer session, Professor G. Tatham spent the summer at Royal Military College, Kingston, Ontario, Professor D.P. Kerr conducted geography courses at the Nova Scotia Summer School, Halifax, N.S., while Professor Spelt and Dr. Richards carried on the summer geography courses at the University of Toronto. Mr. Ali Tayyeb acted as planning officer for the city of Oshawa during the summer months.

Two graduates of the Department, Mr. R.P. Baine M.A. and Mr. John Bousfield M.A. have joined the planning staff of Metropoltian Toronto.

GEOGRAPHY IN ONTARIO SCHOOLS

The Ontario Department of Education has adopted the Grade XI and XII courses in geography. The Grade XIII course (draft) was in the hands of the teachers' committees, educational policy groups, the universities, the teachers colleges, and the Ontario College of Education until January 28, when the Departmental Curriculum Committee began its final revision for publication.

GEOGRAPHICAL BRANCH, OTTAWA

Dr. N.L. Nicholson has been appointed Acting Director upon the resignation of Dr. J. W. Watson to take up the Chair of Geography at the University of Edinburgh.

During the summer of 1954, field work was undertaken as follows:- (party leaders names are underlined):-

Southern Alberta: M.R. Dobson; C.F.J. Whebell.
Minas Basin, Nova Scotia: R. Drinnan; M. Matheson.
Digby to Lunenburg, Nova Scotia: B. Cornwall; J.N. Clark.
Halifax: M. Matheson; S. Bonk, Annemarie Kroger.
Newfoundland settlements: W.R. Summers; C.N. Forward, W.D. Gray.
Montreal urban analysis: P. Camu; M. Sinclair, M. Guérin, P.A. Lamoureux, J.V. Frenette.
Winnipeg urban analysis: T. Weir; J.A. Pelletier, J.H. Warkentin.
Mackenzie delta: J.R. Mackay; J.K. Stager, V. Sim.
Coppermine: M. Marsden; G. Falconer.
Bathurst Inlet: J.B. Bird; M.B. Bird.
Aklavik relocation site survey: J.K. Fraser.

In the office, work continued on the Canadian Ice Distributon Survey (under W.A. Black); the Terrain Collation Project; the Canadian Map Appraisal Project (under B.V. Gutsell) and the Atlas of Canada.

J.K. Stager returned to Ottawa after a year's leave of absence at the University of British Columbia, as did L. Hudon, after six months with the Canadian Army at Shilo, Manitoba. Annemarie Kroger left Ottawa for a year's leave of absence at McGill University. George Bevan is also on leave of absence while serving with the International Supervisory Commission in Indo-China. L. Prior was on detached duty from April to September, 1954, with the Civil Defence organization of the Department of National Health and Welfare. C.N. Forward is on a three month's course at the Ice Observers' School at Washington, D.C.

The Branch published:-

Memoir No. 2.
8 reports in Geographical Bulletin, Nos. 5 and 6
13 articles in professional journals
3 book bibliographies
1 map bibliography

LECTURER or ASSISTANT PROFESSOR OF GEOGRAPHY AT THE UNIVERSITY OF ALBERTA

The University of Alberta invites applications for the position of Lecturer or Assistant Professor of Geography. The appointment will date from September 1st, 1955, with a salary of approximately $4,000, depending on qualifications and experience, plus cost of living bonus, now approximately $300.

Candidates are asked to include with their application transcripts of their academic record, particulars as to experience, publications, systematic and regional specialization and interests, age, marital status and other relevant details, names and addresses of two references, and a recent photograph or snapshot. This material should reach Dr. Walter H. Johns, Dean of the Faculty of Arts and Science, University of Alberta, Edmonton, Alberta, not later than March 31, 1955.